



Aalborg Universitet

AALBORG UNIVERSITY
DENMARK

Persuasive Designs for Learning - Learning in Persuasive Design

Exploring the potential of persuasive designs for learning in complex environments

Hansen, Sandra Burri Gram

DOI (link to publication from Publisher):
[10.5278/vbn.phd.hum.00057](https://doi.org/10.5278/vbn.phd.hum.00057)

Publication date:
2016

Document Version
Publisher's PDF, also known as Version of record

[Link to publication from Aalborg University](#)

Citation for published version (APA):

Hansen, S. B. G. (2016). *Persuasive Designs for Learning - Learning in Persuasive Design: Exploring the potential of persuasive designs for learning in complex environments*. Aalborg Universitetsforlag. Ph.d.-serien for Det Humanistiske Fakultet, Aalborg Universitet <https://doi.org/10.5278/vbn.phd.hum.00057>

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal -

Take down policy

If you believe that this document breaches copyright please contact us at vbn@aub.aau.dk providing details, and we will remove access to the work immediately and investigate your claim.



PERSUASIVE DESIGN FOR LEARNING – LEARNING IN PERSUASIVE DESIGN

EXPLORING THE POTENTIAL OF PERSUASIVE DESIGNS
FOR LEARNING IN COMPLEX ENVIRONMENTS

BY
SANDRA BURRI GRAM-HANSEN

DISSERTATION SUBMITTED 2016



AALBORG UNIVERSITY
DENMARK

PERSUASIVE DESIGN FOR LEARNING – LEARNING IN PERSUASIVE DESIGN

**EXPLORING THE POTENTIAL OF PERSUASIVE DESIGNS
FOR LEARNING IN COMPLEX ENVIRONMENTS**

by

Sandra Burri Gram-Hansen



AALBORG UNIVERSITY
DENMARK

June 30th 2016

Thesis submitted: June 30. 2016

PhD supervisor: Professor (With Specific Responsibilities)
THOMAS RYBERG, Aalborg University

Assistant PhD supervisor: Professor PETER ØHRSTRØM, Aalborg University

PhD committee: Professor ELLEN CHRISTIANSEN, Aalborg
University Denmark
Associate Professor ANNE GERDES,
University of Southern Denmark
Professor Dr. CEES MIDDEN, Technical University of
Eindhoven

PhD Series: Faculty of Humanities, Aalborg University

ISSN (online): 2246-123X
ISBN (online): 978-87-7112-738-6

Published by:
Aalborg University Press
Skjernvej 4A, 2nd floor
DK – 9220 Aalborg Ø
Phone: +45 99407140
aauf@forlag.aau.dk
forlag.aau.dk

© Copyright by author

Printed in Denmark by Rosendahls, 2016



CV

Sandra Burri Gram-Hansen graduated Cum Laude from Aalborg University's Elite Masters Programme in Persuasive Design, in 2010. She worked as a Scientific Assistant, at the Department of Communication and Psychology from 2010 until 2011, where she started in a combination position as part Teaching Assistant Professor and part Ph.D. Fellow. She was initially affiliated with the Computer Mediated Epistemology group, where she contributed as member of the EU funded EuroPLOT project consortium, however in 2012 she transferred to eLearning Lab (eLL) – Center for User Driven Innovation, Learning and Design.

Her research interests centre around the fields of persuasive design, computer mediated communication, behaviour design and learning. With particular interest and enthusiasm towards the area of climate communication and sustainability, and to designs which bridge between the physical and digital realms.

As a teacher she is affiliated with Aalborg University's BA education in Communication and Digital Media, as well as the MA education in Information Architecture. Central topics of her lectures include persuasive design, classical rhetoric and applied ethics.

ENGLISH SUMMARY

In this dissertation, I explore analyse and develop the notion of applying persuasive design in complex learning environments. The project seeks to explore the theoretical and practical cross field between persuasion and learning, and to develop a methodological framework which considered and bridges between user-centred and system-oriented perspectives.

The project springs from my participation in the EuroPLOT EU project which was funded by the EACEA Life Long Learning program. While this project elucidated some of the immediate overlaps between persuasion and learning, it also brought about some frustration, as I found myself unable to establish a distinct claim of persuasive design in relation to learning, based on the project findings. Consequently, the relation between persuasion and learning was further explored as I engaged in a collaboration with the Danish Defence Establishments and Infrastructure Organisation. The aim of this collaboration was to explore the potential of applying persuasive design in the development of digital learning resources for a complex organisation, namely the Danish army.

From my research I establish an outline of persuasive design, which is generally applicable to other research fields. I explore the potential of applying persuasive design to motivate and engage learners in subjects which are not of their immediate interest, and I explore how theories of learning and knowledge processing may contribute to the theoretical and methodological underpinning of persuasive design.

The dissertation is paper based, and does as such contain two separate parts. In the first part I present a summary of the process of my research and my findings, and in the second I include 5 published research papers. The papers have been selected as they correspond to the research questions I seek to address, and also as they contribute to accentuate my process and progress as a researcher throughout this project.

DANSK RESUME

I nærværende afhandling udforsker, analyserer og udvikler jeg potentialet i at applicere persuasive design i udviklingen af læringsdesigns i komplekse læringsmiljøer. Projektet søger at udforske det teoretiske og praktiske krydsfelt mellem persuasion og læring, samt at udvikle et metodisk rammeværk for udarbejdelsen af persuasive designs, som tilgodeser og forbinder brugergenererede kontekstuelle perspektiver, med systemdesign.

Projektet udspringer af min deltagelse i det EU finansierede forskningsprojekt EuroPLOT, som blev finansieret under EACEA puljen Life Long Learning. Mens dette projekt belyste de umiddelbare overlap mellem læring og persuasion, gav det også anledning til frustration, da det på baggrund af projektet ikke forekom muligt at definere en specifik berettigelse af persuasive design i relation til læringsdesigns. Omtalte frustrationer gav anledning til yderligere udforskning af relationen mellem persuasion og læring. Dette blev gjort i forbindelse med et flerårigt samarbejde med Forsvarsministeriets Ejendomsstyrelse, hvor målet var at udforske potentialet i at benytte persuasive design i udviklingen af digitale læringsressourcer til forsvarets medarbejdere i hæren.

Målet med min forskning er at etablere en forståelse af persuasive design, som er generelt applicerbar og som gør det muligt at identificere hvilke bidrag der opnås ved at inddrage persuasive design i mere etablerede praksisfelter så som læring. Særlig opmærksomhed rettes imod potentialet i at benytte persuasive design til at motivere og engagere de lærende i emner som ikke har deres umiddelbare interesse eller opmærksomhed.

Afhandlingen er baseret på en samling af publicerede forskningsartikler, og består således af to separate dele. I afhandlingens første del præsenteres en opsamling af min forskningsproces og mine umiddelbare resultater, mens afhandlingens anden del præsenterer 5 udvalgte forskningsartikler. Artiklerne er blevet udvalgt på baggrund af deres bidrag til besvarelsen af mine forskningsspørgsmål, og ydermere da de belyser den udvikling jeg selv har gennemgået som forsker under mit Ph.d. forløb.

ACKNOWLEDGEMENTS

The writing of this dissertation has not only been an amazing journey but also a feast of experiences, which has over the past 5 years allowed me to learn and network across 2 continents and 8 countries. My years as a Ph.D. fellow have been a time of fantastic intellectual growth, fostered by a mix of wonderful learning environments both at Aalborg University, and also around the world in the international research communities which I have been privileged enough to become a part of.

Writing this dissertation would not have been possible (or half as much fun) without the support of my friends, colleagues and mentors from all of these places.

To My Mentors and Contributors

My principle supervisor, Professor Thomas Ryberg, who has guided me both in teaching and in research, given me immense freedom, and only an occasional tug on the sleeve to bring me back to the focus of my work. Thomas has provided me with the space to explore and indulge myself, while shielding me from the challenges of academia that were not agreeable with whatever intellectual adventures I was on at the time. During my time as a Ph.D. fellow, whenever I have felt dismayed, my meetings with Thomas would immediately restore my enthusiasm and raise my spirits. When I first went to him for help, I asked to teach him everything he knows about learning, in 5 minutes. Now, 4 years down the road, I consider myself privileged that he decided to spend a bit more time than that.

Professor Peter Øhrstrøm supervised me prior to my Ph.D. work, and continued on as co-supervisor in the last three years of my Ph.D. project. Throughout the years, he has been an inspiration and a constant support not only in my practice as a teacher and a researcher but also when I have occasionally felt disheartened and stumped about my situation.

I have been so very privileged to become part of e-Learning Lab, which is in every way an inspirational and supportive community. While all my colleagues have contributed to providing me with a safe port to return home to, I am particularly grateful to Professor Ellen Christiansen and Professor Marianne Lykke who both remain an inspiration to me. When my position as a Ph.D. became exceptionally challenging, Ellen was the one to swiftly help restore my balance. She has been a wonderful collaborator as well as a supportive friend in need. Even before I started

my Ph.D. adventure, Marianne has been a steady support and an inspiration both in research practice and in the delicate balances of academic life. She has been a confidant in the times where my personal life has challenged my work as a researcher, and she continuously makes me feel acknowledged and appreciated.

I am also grateful to several of my mentors in the Persuasive Technology community. Harri Oinas-Kukkonen, Jaap Haam, Cees Midden, Janet Davis and Robert Biddle, have over the years offered me insightful feedback and comments to my work and I am so very appreciative for both their critique and their words of encouragement.

Finally, I owe a very large thank you, to the people who participated in the process. Mark and Kristian from Bunker43, who have contributed with both concept development and technical know-how – and been great company throughout the DDEIO process, Military employees who kindly collaborated and shared their knowledge and opinions with me, and the different students from AAU who have joined in whenever extra hands were necessary. Had it not been for the involvement of all these different people, I would have been pretty stuck as soon as I had done my literature review.

To My Colleagues

I have often been told that writing a Ph.D. is extremely lonely, however in reality my experience has been quite the opposite. Granted, I am rather alone in my work with persuasive design, however my time in the office have provided me with a rich and supportive academic environment and my days have been filled with vibrant discussions - some of which were even academically relevant.

I am particular grateful to the girls in office 1.213, whom I have been fortunate enough to room with for the past several years. Tanja, Mette and Farzana have shared their support in matters far beyond the challenges of my Ph.D., they have indulged me my needs for sour sweets and Christmas chocolates and they have been my shoulders of support whenever needed. I would have undeniably found life as a Ph.D. student at lot less fun, had it not been for them.

I am equally thankful to Lykke, who although we did not share an office, have shared most of the bumps in the road of my research adventure. She and I have on a regular basis sorted out the challenges of both life and research over coffee, and whenever things felt a little lonely, she was the one who understood exactly what I was talking about.

To My Friends and Family

I am lucky to have a very loving and supportive group of family and friends, who have not only provided me with all the encouragement needed to pursue this Ph.D. I am so very grateful to them all, not only for their support to me, but also the help and care they have shown Lasse and our boys while I have been either away or hiding out in the office. Amongst my friends, Thilde Møller Larsen stands out as she did not stop just by cheering me on, she joined in on all the fun, by providing me with a spectacular case to exemplify my work by.

My aunt Ruthie has for as long as I can remember been a support both in education and in my personal life. She has stressed the importance of education, yet also been the one to remind me that also simpler joys have great value – such as growing one's own tomatoes and spending the summer producing soup and ketchup. In so many ways she has shaped my values and taught me that life needs balance, and I am so very grateful for her love and understanding.

My older sister Sarah has always been the tough act to follow, and she is a not an easy person to impress. Her standards are high, and she has never let me off easy on anything, however, she also never fails to be there whenever I need her. Since our Mum passed away, she has been my inspiration both in family matters and in my professional life, regularly provoking me to keep doing things better. With the passing of our Dad, she and her husband Thomas have been the pillars of our family, never failing to provide me with a place that feels like home. I am eternally grateful for all their unwavering support and encouragement.

During my progress as a researcher, I somehow also managed to grow a family of my own, and I am blessed to be the mother of three beautiful boys: Sebastian, Victor and Daniel. Considering that Sebastian and Victor have only just started school, and Daniel still wears a diaper, it is hard to imagine that they have much to contribute to a Ph.D. dissertation. However, throughout the process, they have helped me put things into perspective, both in terms of making my focus on sustainability meaningful, but also in terms of finding a balance between research and personal life which is not just sensible but also fruitful. Their smiles, their creative (and sometimes slightly insane) ideas and even their occasional conflicts, is a constant reminder that real life takes place outside my office and that what I hope to do with my work, is to make that world outside a better place for them to grow up in.

The final and most important person to mention here is my husband Lasse, who is not only an amazing father but also my best friend. Without

his help, his eternal optimism and his willingness to take care of everything in our home in the final months of my writing this dissertation, I never would have reached the final page. Without his love and support I would be a much grumpier person. He has seen me through ups and downs and shared this entire journey with me. He is the strongest and best person I have ever known and I would be lost without him.

I dedicate this work to the memory of my parents Adam and Jonna, and my little sister Gry. I wish that if they were still here, they would be proud of how far I have come.

And to the loving memory of my son Tobias, the light of my life, who I still miss greatly every day. He was the very reason why I started my adventure into academia, striving to combine education with parenthood. Indeed, when I became a single mum at 19, no one expected that I would later on hold a Ph.D. degree.

TABLE OF CONTENTS

CHAPTER 1. THERE AND BACK AGAIN	13
ENGAGING IN A NEW PRACTICE	13
FOCUS OF PH.D.	16
DISSERTATION WALKTHROUGH	19
CHAPTER 2. PLOT.....	21
TEST STUDY AT VESTER HASSING SCHOOL	24
SUMMING UP	32
CHAPTER 3. PERSUASIVE DESIGN – OVERVIEW OF A RESEARCH FIELD .FEJL! DER ER IKKE DEFINERET ET BOGMÆRKE.	
THE NOTION OF PERSUASIVE TECHNOLOGIES	37
ON THE ROLE OF ETHICS IN PERSUASIVE DESIGN	42
METHODS FOR PERSUASIVE DESIGN	47
SUMMING UP	51
CHAPTER 4. RESEARCH DESIGN.....	53
COLLABORATING WITH THE DEFENCE COMMAND DENMARK	53
RESEARCH DESIGN.....	56
CHAPTER 5. PERSUASIVE LEARNING DESIGNS.....	69
PHASE 1: IDENTIFYING PROBLEMS AND INNOVATION POTENTIAL.....	70
PHASE 2: PERSUASIVE DESIGNS FOR LEARNING	99
PHASE 3: TEST AND REFINEMENT OF DESIGN SOLUTION.....	109
PHASE 4: GENERATING NEW KNOWLEDGE	124
SUMMING UP	135
CHAPTER 6. OVERVIEW OF INCLUDED RESEARCH PAPERS.....	137
PAPER I: PERSUASION, LEARNING AND CONTEXT ADAPTATION.....	137
PAPER II: ON THE ROLE OF ETHICS IN PERSUASIVE DESIGN	138
PAPER III: FROM PARTICIPATORY DESIGN AND ONTOLOGICAL ETHICS, TOWARDS AN APPROACH TO CONSTRUCTIVE ETHICS	139
PAPER IV: ACTTENTION – INFLUENCING COMMUNITIES OF PRACTICE WITH PERSUASIVE LEARNING DESIGNS	140
PAPER V: THE EDIE METHOD – TOWARDS AN APPROACH TO COLLABORATION BASED PERSUASIVE DESIGN	140
CHAPTER 7. CONCLUSION.....	142
REFERENCES	147

CHAPTER 1. THERE AND BACK AGAIN

“it’s a dangerous business walking out one’s front door”

(J.R.R. Tolkien, *The Hobbit* 1937)

In the beginning, my idea of writing a Ph.D. was rather romantic, filled with visions and high expectations of what to experience, what to learn and what to share with the world. However, as I embarked into these years of exploring theories, methodologies and unfamiliar practices, it became clear, that my approach to conducting research, in many ways resembles the journey of Bilbo Baggins as described in Tolkien’s immortal tale of *The Hobbit* (Tolkien, 1937). When Bilbo Baggins embarked onto his adventures, he did so with reluctance but also with curiosity. He found that the thing which mostly met his expectations of leaving the Shire, was that the unknown can be quite terrifying and that very few things were as he expected. Likewise, my journey into research practice was initiated with curiosity but also with some confidence that my theoretical benchmark would serve me well as a point of reference. In reality, the process has included challenges, and deviations beyond my expectations, leading me to many findings and understandings, which were not what I originally started out looking for. My apprenticeship as a researcher has not been linear or straight forward, but rather an iterative and explorative adventure. Consequently, as the following chapters present my process, theoretical underpinnings methodological reflections, and significant findings, it must be expected that even my argumentation occasionally shares the irregularity and entanglement which is custom for great adventures.

ENGAGING IN A NEW PRACTICE

In my research I explore analyse and develop the concept of persuasive design and the potential of applying persuasive design in complex learning environments. The project seeks to investigate the theoretical and practical overlap between persuasion and learning, to identify areas in which the two fields may contribute to each other, potential of applying persuasive design in the development of learning designs. Moreover, I initiate the development of a methodological framework for persuasive designs which is applicable in more established fields such as learning. By applying persuasive design in a learning context, the intent is to create designs which not only provide or produce new knowledge, but also motivates the students to become more engaged in the learning experience and/or the presented content.

Prior to this Ph.D. project, my academic interests and education has predominantly focused on the design and implementation of technologies at a more general level. My master degree was specifically concentrated on persuasive technologies and on exploring the notion of persuasion from human centred perspectives such as classical rhetoric and ethics. As a result, theories of learning and practices within digital learning design for me constituted unfamiliar territory in terms of a new research domain.

The focus of my Ph.D. and the wonder upon which my research questions are based, springs from my participation in the EU funded research project PLOT (Persuasive Learning Objects and Technologies) (Behringer, 2010) which was funded by the EACEA Lifelong Learning Programme. I contributed to PLOT with theoretical and methodological perspectives on persuasive design, as well as with development, tests and evaluation of the learning technologies developed within the project (L. B. Gram-Hansen, Gram-Hansen, S. B., 2013; S. B. Gram-Hansen, 2012)

PLOT commenced in November 2010 and had an overall goal to develop a pedagogical framework for active engagement, based on persuasive design. At the time, PLOT constituted a novel approach to developing learning technologies, as the theoretical frameworks for both learning and persuasion were vast, yet had not been systematically combined. Subsequently, the project sought to demonstrate the value of such a framework by creating tools and examples of adaptable, reusable learning resources. In practice, this effort called for a further development of two existing learning technologies, GLOMaker, and 3ET. The pedagogical framework intended to incorporate persuasive design principles, and thereby determine how to create learning designs with potential to change people's behaviour and/or attitudes. The aim of applying persuasive principles in learning technologies was to generate more effective interactive e-learning resources and to provide teachers with the necessary tools to both create new and adapt existing resources to suit their needs.

Besides from developing the theoretical framework for PLOT, I also conducted a case trial within the case of digital dissemination of cultural heritage. The cultural heritage case was represented by The Kaj Munk Research Centre based at Aalborg university, who is an active organisation in researching and promoting Danish author and theologist Kaj Munk. Perspectives from the theoretical framework for persuasive design, lead the project developers to extend one of the included learning technologies, the GLOMaker, from generating traditional learning objects, into also enabling the production of mobile learning objects. By doing so, GLOMaker as a tool became able to facilitate a link between learning

material and specific locations, a functionality which was argued to potentially support the users perception of the learning material (L. B. Gram-Hansen, 2009)

Following PLOT, I further developed my theoretical and methodological understanding of Persuasive Design, through collaboration with the Danish Army and more specifically the Danish Defence Estate and Infrastructure Organisation (DDEIO). In 2012, the DDEIO were initiating their project Green Army Barracks, in which they endeavour to becoming a more energy and environmentally sustainable organisation. It is a general goal of the Danish Defence Command to become more climate friendly, both on their home bases in Denmark, and when participating in international missions. With Project Green Army Barracks, two army bases in Denmark were selected as pilot cases, and their establishment buildings improved to be more climate friendly and energy efficient. The architectural redesign is done in a manner which also optimizes the on base work practices with more versatile facilities and an increased use of digital resources for educational purposes.

My collaboration with DDEIO was initiated when I was invited to facilitate a workshop which aimed to uncover values and practices of the officers working in the Danish army. These values were to be taken into consideration by the internal communicators in charge of climate communication, as a means of optimizing their impact on the employee practices. The workshops lead to interesting discussions about behaviour change in complex organisations, including discussions about the need to change not only the buildings but also the behaviour of the users. Subsequently, I was able to establish a collaboration with the IMC parallel to the Green Army Barracks project, in which I direct specific attention towards facilitating the development of behaviour changing learning designs for the army.

As a result, this project spans from the PLOT project by which I exemplify persuasive learning designs in traditional learning settings, to the DDEIO collaboration in which I expand and develop my understanding of persuasive design and its potential in complex learning environments. Finally, I tie together my theoretical and practical experiences as I initiate the development of a methodological framework for persuasive design. I began my journey into the adventurous life as a Ph.D. student, in the final stages of the PLOT project, resulting in an overlap between that project and my following years of collaboration with the DDEIO. It is by the navigation between different projects and cases that my process as mentioned became slightly tangled.

An implication of my transition from one project to another, lies within my focus as a researcher. Originally, I sought to explore the cross field between persuasive design and digital learning, investigating how the two fields may mutually contribute to each other. However, as my collaboration with DDEIO focuses more specifically on behaviour change (admittedly within a complex learning environment), I have found it necessary to narrow in my research perspective. Though my findings and publications may be of interest to the field of learning and digital learning design, I do predominantly position myself in relation to the persuasive technology community. Hence, the reflections and findings presented in this dissertation primarily focuses on contributing to this distinct field of research.

FOCUS OF PH.D.

The research conducted in PLOT, constituted my initial steps towards an understanding of the theoretical and practical overlap between persuasive design and learning designs. Besides from the Kaj Munk case, PLOT included 3 other distinct cases, all of which succeeded to demonstrate the potential of applying the redesigned learning technologies within their individual settings. However, the project also gave reason to explore both the theoretical and practical cross field even further. From the practical examples provided by the PLOT cases, I did not find it to be clear whether the learning potential of the technologies had been improved by implementation of persuasive principles, or whether the positive results were a result of a higher level of usability. In other words, I did not find that the theoretical foundation of the project nor the results from the case work, enabled me to argue that the learning technologies had become persuasive rather than simply enhanced

As I investigated the theoretical cross field between persuasive technologies and learning in PLOT, several commonalities were identified between constructivist learning and persuasive design, however so were important distinctions. Whilst persuasion may be defined as the intent to change a person's behaviour without using coercion or deception – thus emphasising voluntariness of the persuadee (Atkinson, 2006; Fogg, 2003; Miller, 2002), pedagogy does to some extent focus on making students do something they actually don't want to do (Beetham & Sharpe, 2007). Students may potentially be motivated by different learning designs, but the process of getting the students to use the technologies may not be force-free but simply mandatory, depending on how the testing and evaluation of the learning technologies is done. As such, pedagogy may in some ways conflict with the basic concept of persuasion.

Being unable to justify the claim of persuasive design in relation to learning, to some extent comprises the chore of my curiosity. In spite of the theoretical and practical results achieved through PLOT, I found myself challenged by the theoretical foundation of the project being based primarily on the theories presented by Fogg (Fogg, 2003), particularly as the design principles presented in his work, are not novel approaches to design. His design principles were identified through analysis of existing technologies, and are as such already well known in other design traditions. The novelty of Fogg's research is rather seen in his description of *the functional triad* as a conceptual framework for analysing and understanding ways in which interactive technologies may function as a persuader.

My reservations regarding the theoretical framework developed in PLOT, was further supported by related research which aimed at applying the same persuasive principles to other well established design domains. When exploring the potential of considering the design principles in relation to Information Architecture, Lykke found that whilst the notion of persuasion does hold interesting potential, the design principles themselves did not offer new insights or generate new design directions (Lykke, 2009). Similar conclusions were found in research into applying persuasive principles in relation to digital dissemination of cultural heritage (L. B. Gram-Hansen, 2009).

In spite of these challenges, PLOT and in particular a Kaj Munk test study conducted in a public school setting in in Vester Hassing, inspired me to explore the relation between learning and persuasion further. One of the particularly interesting observations made during the test study, was a transition in learning style which took place as the students were interacting with the mobile GLO's without teacher supervision. Observers noted that the students were indifferent to the technologies, yet still found the learning experience to be motivating and engaging, leading me to the supposition that the potential of persuasive design in relation to learning, may not be constituted by new ways of designing learning technologies. Rather it is found in new approaches to applying technologies in a learning context as a mean to motivating and engaging students in a given topic. Moreover, amongst the perspectives that were not addressed through PLOT, are the questions regarding the potential of considering learning theories in relation to persuasive design.

Consequently, my research interests became focused on extending and developing my understanding of persuasive design, in order to argue towards its claim in relation to other more established research areas. The existence of a potentially significant link between learning theory and

persuasion, has been previously suggested (Miller, 2002). However, within the persuasive technology community, very few researchers have addressed this perspective (Lucero, Zuloaga, Mota, & Muñoz, 2006; Müller, Rivera-Pelayo, & Heuer, 2012)

Since the publication of Fogg's original work in 2003, Persuasive technologies have become a worldwide area of interest for both researchers and design practitioners. 2015 marked the 10th annual international conference on persuasive technologies, constituting an event which gathers world wide range of participants. Presentations and publications span from methodological approaches to persuasive system design, (H. Oinas-Kukkonen & Harjumaa, 2008), to user-centred and value oriented approaches to technology design (Davis, 2010; Lockton, Harrison, & Stanton, 2008). Moreover, numerous examples of persuasive technologies have been presented, supporting a wider understanding of persuasive technologies as a concept.

In the acknowledgement that the past 500 years of research and debate into the notion of persuasion, has not lead to a clear definition of the concept, my intention is not to produce one in this project. I do however aim to extend the understanding of persuasive design in relation to development, implementation and evaluation of digital resources, in a way that acknowledges existing research within this field, and in a way that is applicable for both researchers and practitioners.

Although my initial motivation for this endeavour was primarily grounded in the challenges recognized through my participation in the PLOT project, I find that the significance of my work is further endorsed when considering the advancement in behaviour changing design over the past decade. Although Fogg's research in persuasive technology is acknowledged as a novel perspective on the potential of interactive technologies, his work was soon followed by Thaler and Sunstein's introduction of another approach to behaviour change designs; Nudging (Thaler & Sunstein, 2009). Similar to persuasive technology and persuasive design, nudging is based on years of research in social psychology, and with the introduction of *digital nudging* (Weinmann, Schneider, & Vom Brocke, 2015), the distinctions between these different approaches to behaviour design has become more of a grey area. Thus, by exploring the characteristics of persuasive technology, I seek not only to establish the unique claim of persuasive design in relation to other research areas, I also aim to facilitate behaviour design practitioners in distinguishing between the two approaches, and thus become able to select the right method depending on the intended behaviour change.

Hence, my research has been targeted towards addressing the following questions:

- What defines persuasive design as an approach to behaviour design, which is applicable both in theory and in practice?
- What defines a persuasive learning design and in what ways do theories and of learning and knowledge processing contribute to the definition of persuasive design?
- How can different perspectives of persuasive technology and persuasive design be applied in the development of persuasive learning designs?
- Is it possible to develop a methodological approach to persuasive design, which bridges between system-oriented design features and user-centred perspectives?

DISSERTATION WALKTHROUGH

The research presented in this dissertation is based on a number of research papers which I have published both in relation to PLOT, and later on in relation to my collaboration with the Danish army. I have included five of these publications, which have been selected as they address specific elements of my research questions, and furthermore help document my process as a researcher. As a result, this dissertation may be seen as divided into two separate parts. In part 1, I explain my process, my methodological considerations and the results upon which I base my findings. Part 2 contains the 5 papers selected to be included in this dissertation. Part 2 is submitted in an adjunct file.

In Chapter 1, I have explained the background for my interest in persuasive design and in exploring its potential in relation to digital learning. I have described some of the challenges faced as I participated in PLOT, and argued towards the importance of exploring persuasive design further in order to suggest its claim in relation to learning.

In Chapter 2, I provide a brief overview of PLOT, the theoretical foundation of the project and of the test study I conducted within the project. This particular test study distinguishes itself from the other cases in PLOT, by distinctly considering the location as part of the design. Although conducted in the early stages of my Ph.D. process, the study constitutes an exemplification of persuasive design applied in a traditional learning context. Moreover, the findings form the basis of my subsequent research into a theoretical and practical understanding of persuasive design.

In Chapter 3, I extend my theoretical foundation of persuasive design, through a literature review of the field of persuasive technology. I discuss core elements of persuasion, and point towards aspects that are particularly important to consider for practitioners striving to design technologies with the potential to change user's attitudes and/or behaviour.

In Chapter 4, I present my research design for the DDEIO collaboration. I applied Design Based Research as a methodological framework for the study, enabling myself to facilitate the development of persuasive learning design for the recruits in the Danish army, and at the same time develop a methodology which may be applicable at a more general level.

In Chapter 5, I provide a descriptive overview of the process of my design and research collaboration with DDEIO, drawing particular attention towards the encounter of the process which were particular significant. With this chapter I seek to distinctly explain how different aspects of persuasive technology was considered in the design process. Moreover, an emphasis is placed on my methodological practice, and on ways in which this may form the foundation for a more generally applicable persuasive design methodology.

In Chapter 6, short summaries of the five research papers included in this dissertation are provide, along with a brief overview of how the papers contribute to the answering of my research questions.

In Chapter 7 I present my conclusions, and final reflections.

CHAPTER 2. PLOT

In this chapter, I provide a brief overview of the PLOT project and the mentioned test study which I conducted in a Danish public school. The aim is partly to elaborate upon the springboard of my further research, but also to establish the theoretical benchmark for research in persuasive technology over the past decade.

As described in the previous chapter, the EU funded EuroPLOT project sought to develop persuasive learning designs by combining theories and methods of persuasive design and learning into a new pedagogical and methodological framework. This framework would then be applied in the further development of 2 existing learning technologies, GLOMaker, which is a tool for developing learning objects, and 3ET which is a corpus driven learning technology for grammatical exercises. Subsequently the technologies would be empirically tested through 4 individual cases *archival work, language learning, environment and business computing* (Behringer, 2010). The cases shared the challenge that they generate highly complex learning material, which practitioners within the different domains are required to understand, but which is rarely the main focus of said practitioners. For instance, practitioners of digital dissemination of culture, may not have a specific interest in certain types of old literature, yet they are obliged to read it in order to gain a fuller understanding of the cultural legacy which they are disseminating.

The approach taken to persuasive design in PLOT, was based on BJ Fogg's definition of persuasive technologies as being *"any type of interactive computer technology designed with the intent to change people's attitudes or behaviour, without using coercion or deception"* (Fogg, 2003). The framework was further developed from a combination of social psychology (Miller, 2002) and classical rhetoric with particular attention paid towards the rhetorical notion of Kairos (Kinneavy, 2002).

Having analysed a large number of different interactive technologies, Fogg suggested that interactive technologies hold a particular potential as persuasive media, due to a combination of technical advantages such as multimodality, persistency, scalability and data management, and also psychological advantages such as high level anonymity and the ability to be ubiquitous (Fogg, 2003). Not only do interactive technologies enable designers to intensify the persuasive argument through digital designs, Fogg also emphasises that the late 90's marked a transition in the way users relate to technologies. As interactive technologies and the internet was becoming a common part of life for many people around the world, our

scepticism towards interactive technologies was decreasing. In some situations, users would even find themselves more comfortable confiding in a technology than in an actual person. E.g. a user striving for a weight loss would in some situations feel safer sharing their actual weight with a personal profile on a website, rather than with friends or a dietician.

Fogg's analytical work also formed the basis of one of the key benchmarks for the further development of the Persuasive Technology research field; the *Functional Triad*. Having explored a vast variety of interactive technologies which at the time showed persuasive potential, Fogg developed the functional triad as a conceptual visualisation of three different roles a technology might play from the perspective of a user; *Tool*, *Medium*, *Social Actor*. Moreover, for each individual role, Fogg identified a number of persuasive design principles in order to explain how different system functionality might facilitate a persuasive outcome (Fogg, 2003). A brief overview of the roles and principles is provided in the following table:

Role	Ability	Principle
Tool	Making target behaviour easier to do Leading people through a process. Performing calculations or measurements that motivate	Reduction Tunnelling Tailoring Suggestion Self-monitoring Surveillance Conditioning
Medium	Allowing people to explore cause-and-effect relationships Providing people with vicarious experiences that motivate Helping people rehearse a behaviour	Simulation
Social Actor	Rewarding people with positive feedback Modelling a target behaviour or attitude Providing social support	Social signals

(S. B. Gram-Hansen, 2012)

The notion of persuasion itself may be traced back to Aristotle and to the rhetorical understanding of communication as a strategic action, in which the intent is to win over ones audience (Hasle & Christensen, 2007). In classical rhetoric, Kairos is considered a key component in persuasion, constituting the appropriate time, manner and place for a persuasive action to be successful (Kinneavy, 2002). The concept sums up the

principle that any rhetorical approach is based upon the specific situation, and that comprehension of the context as such is one of the most vital resources when deciding upon rhetorical means to apply to a given argument (Glud & Jespersen, 2008; S. B. Gram-Hansen, Schärfe, & Dinesen, 2012). Within the field of persuasive technologies, Kairos is mostly referred to as the appropriate moment to apply a given persuasive principle, or in later years to elaborating on the potential of mobile technologies in relation to persuasion (Aagaard, 2008). As the world was introduced to smartphones, Fogg argued that the mobile phone held particular persuasive potential, partly due to the technical affordances of the devices and partly due to the emotional relationship between users and mobile phones (Fogg, 2007). With the smartphone era and a new design focus on apps for mobile devices, Kairos was referenced when mobile systems were able to combine location and context information in new personalised user experiences (Fogg & Eckles, 2007).

The primary approach to learning was constructivist in the sense that learning was considered endogenous and based on experience. The decision to focus on constructivist approaches to learning, was brought about by persuasive technologies being defined as interactive. Amongst the widely accepted approaches to constructivist learning, is the notion of Outcome Based Learning (OBL) as introduced by John Biggs and Catherine Tang, (Biggs & Tang, 2007) OBL is traditionally a teaching method which distinguishes itself by focusing on the student and by acknowledging that different students learn in different ways and may as a result require different styles of teaching. Furthermore, Biggs and Tang argue that the role of the teacher is to motivate students and to facilitate the learning process, whilst acknowledging that learning depends on a mutual responsibility between the teacher and the student.

The above mentioned perspectives from Biggs and Tang made the approach particularly interesting to PLOT, as an immediate overlap between learning design and persuasive design was identified, as exemplified in the following table:

Persuasive Design	Outcome Based Learning
<ul style="list-style-type: none"> • Originates from persuasive intentions • Considered the requisites of the users • Requires that the user is aware of the persuasive intention 	<ul style="list-style-type: none"> • Originates from an intended learning outcome • Considered the requisite of the learners • Requires that the students are aware of the intended

<ul style="list-style-type: none"> • The persuasive intention is met through use of one or more persuasive strategies • Is dependent on timing and contextual awareness. 	<p>outcome of individual lectures and courses</p> <ul style="list-style-type: none"> • The intended learning outcome is achieved by use of rhetorical and didactic strategies • Is dependent on timing and contextual awareness
--	---

By considering learning a mutual responsibility between the teacher and the student, the notion of learning could be related to the previous argument that an appropriate balance between the intentions of the designer and the intentions of the user are required if a persuasive design is to be successful. Further commonalities were also identified in relation to the importance of timing, context awareness and design approaches (S. B. Gram-Hansen, 2012).

TEST STUDY AT VESTER HASSING SCHOOL

Kaj Munk was a Danish poet, playwright and vicar, who wrote a number of dramas concerning the nature of the relationship between God and Man. Most famously, he wrote *The Word* which is a theological questioning of miracles and the faith in God, inspired by the tragic death of one of Munk's parishioners in childbirth.

Munk gained notoriety during the German occupation of Denmark during WW2 for his outspoken criticism of the occupying forces. His sermons at the Vedersø Church during the war became increasingly critical of the German occupation and he was one of the public persons that openly opposed the occupational forces. His final sermon in January 1944 included a direct support of the Danish resistance (until late 1943 they were generally considered unpopular because their acts of sabotage would only provoke retaliation from the Germans) and a very direct reminder that although the German soldiers were not personally to blame it was the duty of all true Danes to resist and kill the German forces in Denmark¹. Munk met his untimely end only three days after the sermon in January 1944 when German SS agents picked him up at the vicarage, executed him, and left his body in a ditch in the countryside. Obviously, he had become too much of a liability for the German forces and therefore they

¹ Sermon in Vedersø Church, January 1st, 1944

decided to remove him by force. He achieved martyrdom in the aftermath as he was an outstanding example of the non-armed, intellectual and open resistance against the Germans as opposed to the secret and armed members of the Danish resistance.

A particular outcome of PLOT was a mobile version of the GLOMaker (MobileGLO), which was developed with the intent to enable learning activities to be directly linked to physical locations. This was highly inspired by the notion of Kairos, and particularly the importance of considering the appropriate place. The MobileGLO was found to be particularly relevant to the Kaj Munk case, due to the distinct link between Kaj Munk as a historical figure, his literary works and specific locations in Denmark.

To test MobileGLO in practice, a test study was arranged to take place in the small town of Vester Hassing in Northern Jutland. The strongest tie between Munk and Vester Hassing is the story of an exchange between Munk and Siegumfeldt, who was the vicar of Vester Hassing church from 1931 to 1945². Siegumfeldt was a great admirer of Munk and a passionate collector of everything related to the works of Munk; dramas, books, letters sent to newspapers etc. Siegumfeldt was especially interested in a copy of the play *Pilatus* that Munk had only printed and distributed to close friends. The vicar tried to establish a friendship with Munk who declined the request on the grounds that Siegumfeldt was not funny enough to befriend Munk. Siegumfeldt reacted by having the local snow bailiff send a letter to Munk attesting that Siegumfeldt was indeed a funny man. This convinced Munk that Siegumfeldt was worthy of his friendship and he promptly sent him a copy of *Pilatus*. What is interesting for the town of Vester Hassing is the fact that Munk subsequently decided to visit Vester Hassing church and conduct a sermon there after his merry exchange with Siegumfeldt. The church was filled to the brim for the visit of Munk, and even though the sermon itself was rumoured to be a very average one, it was a big occasion for the small town.

In the big picture of Kaj Munk's heritage, the Vester Hassing story bears little significance, but in the context of the test study it was used to establish a link between Munk and Vester Hassing. Additionally, the Siegumfeldt anecdote also provided an insight into the personality of Kaj Munk as it reveals a humorous side to Munk that is predominantly missing in the more significant stories of the troubled yet incisive vicar from Vedersø. In spite of the weak tie to the location, Vester Hassing was

² <http://www.kajmunk.hum.aau.dk/index.php?page=siegumfeldt-og-kaj-munk>

deemed fit for the case study, as such week ties are very often a reality for teachers planning a course.

GROUP OF RESPONDENTS

The group of respondents for the test study consisted of 18 7th grade students at the age of 13-14 years. The group had no special basis for participating in the study and they had been selected by the school officials after having approved that one of their classes was allowed to participate. The group of students were expected to be familiar with central elements of World War II but have no prior knowledge of Kaj Munk. This would provide a baseline for the learning aspect of the test study, as the background knowledge of Munk could be expected to be very similar between students and any knowledge about Munk from the students would have been gained during the test study.

A week before the test study, a preceding visit to the class was made where the students were given the chance to get acquainted with the schedule for the test study and to ask questions about the whole setup. There were several reasons for making a preceding visit to the class. Firstly, by preparing the students for the study it was expected that they would be more focused on their tasks and more conscious about what was expected from them during the test study. Secondly, it was important to confirm our expectations towards the student's level of knowledge in relation to World War II and Kaj Munk. The students were asked to anonymously answer to following four questions in writing:

1. How interesting do you find history classes?
2. Have you heard about World War II?
3. Have you heard about the resistance during World War II?
4. Do you know who Kaj Munk was?

As expected the answers showed that the students had no prior knowledge about Munk, as all 18 answered negatively to question 4. But to my surprise, they had very limited knowledge about World War II and the resistance as it had not yet been part of their curriculum. Therefore, their knowledge about World War II was restricted to what they had gathered from popular culture such as movies and literature. Subsequently it was assessed that these students could not be expected to fully understand the complex situation in Denmark during World War II where Kaj Munk's role as a social debater culminated.

The result of the preceding visit was a confirmation that the students had no basis knowledge of Kaj Munk but an indication that the topic of World

War II could only be used as a point of origin for the test study if the texts were heavily simplified and targeted the students' realm of understanding. It was also confirmed that the students were very enthusiastic about new technologies and practically every student owned a smartphone. It turned out that the students were already divided into groups of three or four and it was decided to keep these groups for the test study.

CONDUCTING THE TEST STUDY

The test study was initiated with a short introduction to the events of the day containing as little information about Kaj Munk as possible. The primary purpose of the introduction was to help the students create structure and a frame around the test study. It was considered rather important not to present Kaj Munk in detail as it would make it harder to assess how much knowledge about Munk the students had obtained through their work with the learning objects.

In order to test different types of learning objects for the PLOT project, GLOMaker was used to develop both traditional and mobile learning objects about Kaj Munk that were all linked to two overall intended learning outcomes: to gain knowledge about Kaj Munk and to improve understanding of his literary works and their connection to the circumstances under which they were written. Based on the knowledge gained during the preceding visit, the language and overall complexity was adapted to the target group and elements of everyday speech, easily read texts with explanation of difficult words, images, icons, and basic quizzes was included. As mentioned above, World War II was used as the focal point for Kaj Munk's heritage so the learning objects were primarily linked to his role during the war and only to a lesser extent to his broader role as vicar, poet or cultural person in Denmark.

The traditional learning objects were embedded on a website made for the test study so the students did not have to use dedicated software to access them³. The four traditional learning objects could be accessed in any order, and the students could navigate back and forth in the material making it an available resource they could continually consult. GLOMaker provides a number of premade features, including different tasks and quizzes in the learning object where the student has to provide a correct answer or connect different statements.

The mobile GLOMaker supports GPS navigation, making it possible to trigger a learning object when the student is in a specific geographical

³ <http://kajmunkivesterhassing.weebly.com/>

location. However, it was a real concern that the GPS navigation would only be interesting for the student, who was actually carrying the tablet and subsequently could see information about distance and direction to the next mobile learning object. To avoid this and to further the interaction and communication between students it was decided that the study should use QR-codes rather than GPS. The learning object was activated by scanning a QR-code with the tablet's camera which added an element of collaborative treasure hunt when locating the QR-code. In total, six mobile learning objects were created and linked together in a single path through Vester Hassing. The path started from the school towards the church and back to the school again via the old closed down railway station. QR-codes were printed and placed in relevant places beforehand so the mobile learning objects could be activated in the right sequence and at the right place.

To make the work with the traditional learning objects more goal-oriented, a question sheet was prepared with the following ten questions that had to be answered by each group:

1. Who was Kaj Munk?
2. Where did Kaj Munk work and what was his job?
3. 2 + (the year Kaj Munk was shot) =
4. How many children did Kaj and Lise Munk have and what were their names?
5. (The year Kaj Munk was appointed as vicar in Vedersø) + (the year Kaj Munk was shot) =
6. The names of Kaj Munk's foster parents?
7. What inspired Munk to write his drama, *The Word*
8. Why did Kaj Munk choose to become a vicar?
9. What is the play *Niels Ebbesen* about and why did it anger the Germans?
10. Why is it important to hear about Kaj Munk when learning about World War II?

The answer to all ten questions were found in the learning objects so it was not necessary for the students to use other resources, such as web searches, during the group work phase. The question sheet was printed and handed to all students to ensure that everyone had access to the questions and could be active in answering the question.



Figure 1 - Picture from the group work phase

The purpose of the question sheet and the learning objects was to see if the students were able to use these types of learning objects as a resource in solving a specific task. The question sheet gave a very clear indication of how well the students attained new knowledge, especially taking into consideration that they were unable to answer any of the ten questions beforehand.

To elaborate on the treasure hunt metaphor from e.g. Geocaching it was originally planned that the assignment with the traditional learning objects and the question sheet should give the students clues towards how and where the first mobile learning object could be activated. The intent was to create a clear connection between the classroom activities and the mobile path. However, as it would be highly impractical to have all five groups following the mobile path at the same time, it was decided to send the students off at a fixed interval of five minutes. Their first mobile learning object was activated in class and when they returned from the mobile path they could finish the question sheet.

As an ending to the test study itself, a Kaj Munk quiz was prepared with ten questions about Kaj Munk that was aimed at information from both mobile and traditional learning objects. The purpose of the quiz was to test if the students could remember basic details about Kaj Munk's life and works and more generally about World War II. The quiz was answered in groups and the students were not allowed to make use of question sheet, notes and learning objects from the earlier phases of the test study. Their only aid allowed during the quiz was the photos they had taken during the mobile path. The questions varied between factual details about Kaj Munk and elements that the students would only be able to answer correctly if

they had followed the mobile path and solved the assignments. As an example, the question about the distance to Frederikshavn could only be answered if the group had been at the old railway station, noticed the distance on the sign, and solved the photo assignment correctly.



Figure 2 - Students exploring church location

The test study was evaluated through a combination of qualitative and quantitative data collections and observations throughout the study. Three different sheets were prepared for the evaluation of the student's experience of the test study; a short questionnaire and two coloured sheets. It was a conscious choice to have a bias towards qualitative evaluation methods so that the evaluation would not only indicate how effective the test study had been but also highlight the elements that the students felt influenced them most. The evaluation was structured according to the phenomenographic research method under which it is advised not to ask leading questions or ask for elaborations on the answers given (Ashworth & Lucas, 2000). This is explained by the wish to obtain qualitative data from the test study as well as an assumption that the students are at an age where they are easily influenced by others and would be inclined to view the present researchers as authorities.

The evaluation was supported by field observations during the test study as each group of students were appointed an observer from the team of researchers. The observer was to write down observations made during the classroom activities and on the mobile path and also to take photos to help remember specific situations.

The aim of the observation studies was to give an insight into the interaction between the students and the technology but also amongst the

students. The assumption was made that the students could not be expected to be conscious about how their interactions during the test study influenced their experiences and they may leave out potentially important details when evaluating the whole study. The observation studies are a supplement to the more stringently documented evaluation data.

The observer was allowed to interrupt the students and ask questions during their activities, and this could be understood as a type of *in situ interview* (Zander, 2010). This was done to provide a more direct link between the observations made and the students' thoughts, giving a richer understanding of how the students experienced the different activities.

PRELIMINARY FINDINGS

Several observers expressed surprise at the general lack of enthusiasm displayed by the students when venturing out on the mobile path. Beforehand, the students had expressed great anticipation towards trying out the tablets and it was expected that they would be very interested in the mobile learning objects on the tablets. However, in reality the students generally showed little interest in the technology. Typically, one student read the material out loud when at the QR-code, and while the role of who held the tablet shifted in some of the groups, the students were generally not very interested in taking responsibility for their group. While their attitude towards technology in general was positive and confident, the tablets were insufficient to remarkably impress the students. Both from a learning and a persuasive perspective this could be interpreted in a positive way, as it meant that the technology was not taking away their attention from the mobile learning objects themselves.

While the immediate impression of the students at the QR-codes was one of relative indifference, it appeared that the students were more engaged during the walks between the places and displayed knowledge about the material that had just been presented to them. Several observers noted that the students used the time between locations to discuss the material just presented to achieve a shared understanding of the material within the group. These discussions were not enticed by the observers but could possibly be explained by Vester Hassing school's general focus on *collaborative learning* as the students were familiar with communicating knowledge to each other. As such, their normal behaviour in a learning situation was also displayed during the mobile activities.

The results from the quiz showed that most of the students were able to answer all questions correctly and that the difference between groups was in details such as the number of Kaj Munk plays the groups could name.

This was regarded as a positive result, as the students displayed an adequate knowledge of Kaj Munk and the time he lived in after only few hours of activities. The knowledge displayed in the quiz was primarily gathered via the students' ability to cooperate and communicate about the material, supported by the activities and points, underlined by the learning technologies.

The overall assessment of the Vester Hassing school study was that while the topic was perhaps too complex for the age group, the setup itself showed great promise. However, the potential of the setup predominantly served as a motivating factor, not necessarily as an improved approach to learning designs. The role of the learning activities described in the test study could potentially be as an introduction to a new topic, where the work with learning objects and mobile paths can provide a motivating and engaging entrance into a more traditional, in-depth classroom course about the topic. Motivating students and acknowledging their ability to acquire knowledge through immediate feedback might help motivate them towards further learning activities about the topic.

SUMMING UP

As previously stated, the PLOT project and particularly the Vester Hassing school pilot study, constitutes my primary springboard into further exploring the potential of persuasive design in learning context. Although the theoretical foundation of PLOT left me greatly challenged with regards to stating a claim for persuasive design in relation to learning, the project also left me with certain insights which formed the springboard of my further research.

Firstly, in spite of the identified overlaps between Fogg's theoretical framework and Biggs and Tangs constructivist approach to learning, the distinctions between persuasion and learning, may potentially be found when also considering the intentions of the users. The attempt to create engaging and motivating learning technologies, e.g. learning games, is not in itself novel, and is to some degree comparable to the efforts made within PLOT. Similar approaches have been referred to as chocolate covered broccoli, as the system may be both visually pleasing and game inspired, yet the users are still being prompted to something they are not particularly interested in doing (Glasemann, Kanstrup, & Ryberg, 2010). Persuasive technology on the other hand draws upon the endogenous intentions of the users, and does as such require an appropriate balance to be established between the intentions of the designer and those of the user, if the persuasive initiative is to be successful.

Furthermore, although it may be tempting to assume that technologies will be more motivating, engaging and even persuasive, simply by enhancing the usability of the system, or making them more “game-like” and entertaining, I will argue that neither learning, nor behaviour change can be achieved simply by making things more easy.

Finally, the case study in Vester Hassing indicated that Kairos, and particularly considerations regarding the appropriate place, may hold a particular potential with regards to persuasive learning designs. Through the case study it was exemplified how the physical surroundings could be actively considered as part of the design, rather than an obstacle for engaging learning. Evaluations indicated that the requirement to be productive at the selected locations, not only made the design more engaging, it also helped the student remember and process new knowledge. For me, this initiated reflections regarding the relationship between the persuasive initiative and the intended use context, which I will elaborate on further in the following chapter.

CHAPTER 3. FROM PERSUASIVE TECHNOLOGY TO PERSUASIVE DESIGN

Motivated by the previously mentioned challenges identified in PLOT, and in order to generate directions for the theoretical and methodological foundation for my collaboration with the Danish Defence Estate and Infrastructure Organisation (DDEIO), I conducted a thorough literature review and analysis of the current body of research knowledge within the Persuasive Technology domain. In this chapter, results of the literature review have been transformed into a state of the art of the first eight years of research in persuasive technologies, with a particular focus on perspectives on persuasion, design methods and ethical considerations.

A similar state of the art was conducted by Kristian Torning and Harri Oinas-Kukkonen and published in 2009 (Torning & Oinas-Kukkonen, 2009). They investigated the research published as full papers in the conference proceedings from the first three Persuasive Technology conferences (2006-2008), in order to generate directions for future research within the field. Methodologically, they applied the Persuasive System Design (PSD) Model (H. Oinas-Kukkonen & Harjumaa, 2009) as an analytical framework, enabling them to explore the specific use of persuasive principles applied in the technologies which were presented over the three years. They subsequently presented at list of directions for future research, based on aspects they found were not being sufficiently addressed at the time. Specifically, Torning and Oinas-Kukkonen found that the following areas required further research attention:

- **Persuasive Design Methods** – At the time there were not many conceptual models for persuasive system design, and a clear lack of empirically proven models.
- **Persuasive Design patterns** – It was found that some modes of interaction were more persuasive than others. HCI system designers might have a tendency to focus primarily on ways to make the desired task on e.g. a website as easy as possible, however, persuasive interaction design patterns were suggested to potentially provide other important perspectives.
- **Software Audiences** – Further research into the different roles of the persuadees was recommended. In the acknowledgement that different audiences require different persuasive strategies, it was

suggested that gender and cultural differences should be explored further.

- **Scientific and Theoretical concerns** – It was emphasised that persuasive technology is a multi-disciplinary area covering a number of defining perspectives some of which have been debated for several thousand years. Attention should be directed towards ways of combining classic ontological discussions with modern system engineering.
- **Ethical Concerns** – In spite of potential noble outcomes, it was stressed that ethical considerations need far more attention, both with regards to development of systems and implementation into different contexts (Torning & Oinas-Kukkonen, 2009).

The points made by Torning and Oinas-Kukkonen underline the relevance of my research to the field of persuasive technology. In particular, I intend to contribute to the scientific, theoretical and ethical concerns, as well as conceptualise as methodological framework, based on empirical research. While I acknowledge the findings by Torning and Oinas-Kukkonen, I still choose to conduct my own review rather than base my work upon theirs. Their findings are substantial and relevant, but the aim of my research is to acquire a deeper understanding of the notion of persuasive design, and to produce a methodology, which acknowledges and combines the different approaches dominating the field. For this reason I found that a new literature review was necessary, in order to focus specifically on perspectives considered relevant to this dissertation.

The Persuasive Technology conference series is a well-established scientific forum dedicated to research and practice within the area of designs for behaviour change. Although the notion of persuasion, and different perspectives on persuasive design are also presented at other conferences and in academic journals, the Persuasive Technology conference proceedings constitute the most coherent collection of research on the topic.

The literature review was conducted with a particular interest in different perspectives on the concept of persuasion, methodological approaches, and also on primary domains of application. I specified my approach to include only full peer-reviewed papers, as short papers and poster papers often describe work in progress, or appear limited in their theoretical discussions due to the reduced number of pages. As a result, research data was narrowed down to 133 papers published in the years 2006-2013.

A systematic overview of the papers, their themes, and the theoretical and methodological perspectives, was established by applying NVivo⁴ as a tool for categorisation, search, and analysis. The papers were broadly categorized in terms of application domain and contributions to the persuasive technology field, followed by a more detailed categorization process distinguishing between methodological contributions, ethical contributions and specific subdomains to persuasive technologies, such as persuasive games, mobile persuasion and ambient persuasion. Categorization of the papers was done by use of NVivo Nodes.

Not unexpectedly, the majority of papers sought to extend the practical or theoretical foundation of the field. 71 papers were categorized as *General Contributions*, and include different methodological perspectives as well as more distinct focus areas such as ambient persuasion, web design principles, and ethical concerns such as credibility. From the papers referring to distinct domains of application, *Health* was identified as the predominant domain, with 41 papers targeting subdomains such as mental wellbeing, smoking cessation, and physical activity increase. The second most referenced domain was identified as *Sustainability* with 12 papers, however, the majority of papers with this reference were published in 2012 and 2013.

Persuasion is generally understood as holding a strong ethical demand – also addressed by Fogg as he defined the concept as “behaviour change without using coercion or deception” (Fogg, 2003), and as such, the nature of prevalent domains were of little surprise. What does however strike me as interesting, is that while health has been a popular domain throughout the conference series, the majority of papers focusing on sustainability have been published in 2012 and 2013. I interpret this to be an early indication of a transition in the field. Where health focuses on behaviour changes to improve life of the individual, there appears to be a shift towards a more community oriented focus on sustainability.

While a majority of the reviewed papers served as a benchmark for understanding the domains in which persuasive technologies are primarily applied, a number of papers focusing more specifically on the theoretical and methodological implications of designing persuasive technologies were identified. In the following sections, I provide a summarised analysis of my key findings, including a discussion of perspectives which I found to be of particular importance to my further

⁴ NVivo is software that supports qualitative and mixed methods research. It is designed to assist in organizing, analysing and finding insights in unstructured, or qualitative data

process. In particular, I highlight diverging methodological approaches along with ethical considerations related to the field.

THE NOTION OF PERSUASIVE TECHNOLOGIES

When introducing the notion of persuasive technologies, Fogg defined them as *interactive technologies designed with the intention to change attitudes or behaviours* (Fogg, 2003). The definition was based on the broader definition of persuasion as being an attempt to change attitudes or behaviours (without using coercion or deception). Fogg stated that his definition of persuasion was intentionally very broad, in order for various persuasion professionals including clinical psychologists, academic researchers, and marketing experts to agree and support it. Fogg furthermore stressed that the dismissal of coercive or deceptive strategies was fundamental, as persuasion constitutes a voluntary change in attitude or behaviour (Fogg, 2003).

To specify the definition of persuasive technologies further, persuasion was defined as being based on intention rather than outcomes – thus distinguishing between technologies that coincidentally influence the user's behaviour, and those that have been designed with the specific intention at mind. An example of such could be the Nintendo Wii console, which upon its release became a motivating factor for many users to become more physical active, and was by some applied as a home exercise tool. While the Wii did influence behaviour, the console itself does not categorize as a persuasive technology. However, some games developed for the console, such as Wii Sports, may be defined as persuasive due to the specific intention to motivate users to be more physically active.

Although the majority of researchers within the persuasive technology field refer to Fogg's definitions, his perspective has also been met with some critique. At the first conference on persuasive technology held in 2006, Bernardine Atkinson presented a critical review of Fogg's book, pointing towards what she considered some crucial shortcomings (Atkinson, 2006).

Atkinson referenced another review conducted by Robert Johnson, who argued that although Fogg suggested that focus was placed on the end users, his book is in fact designer- and system-oriented. No attention was directed towards user-centred or usability oriented perspectives in development or evaluation of the technologies. Moreover, it was pointed out that by stressing that persuasive technologies are not coercive or deceptive, ethical reflections become obligatory when persuasive technologies are created – a requirement which would not be addressed

unless persuasive technologies were designed from a user-centred perspective (Atkinson, 2006). Atkinson elaborated on the ethical challenges brought about from Fogg's definitions, by also addressing the distinct focus on Human Computer Interaction (HCI). As computers are objects rather than subjects, the systems cannot be held accountable for any outcomes. Subsequently, persuasive technologies should rather be researched from a Computer Mediated Communication (CMC) perspective.

Another significant perspective on persuasive technology, is presented by Johan Redström (Redström, 2006), and constitutes a more design oriented perspective than the one presented by Atkinson. Redström firstly addresses the relevance of considering rhetoric in relation to persuasive technology, as design in itself may be considered a rhetorical action (Redström, 2006). In my interpretation, as the world has become increasingly man-made, more and more things may be seen as a product of design. Designs are created with a specific intention in mind, and through e.g. shapes, colours and areas of application, the intended use is communicated to the user (S. B. Gram-Hansen, 2010).

In relation to persuasive technology, the “design is communication” argument becomes problematic, as all technologies may then be considered persuasive, in the sense that they are most often designed with the intent to change a user practice (Redström, 2006). To accommodate this particular challenge, Redström suggests that either the definition of persuasive technologies is specified further, or perhaps even better, that the perspective on persuasive design is changed. Redström suggests that persuasive design, rather than being looked upon as a specific kind of technologies, might rather constitute a set of theories and methods, which enables designers to include persuasive considerations in various design processes. Redström exemplifies this through reference to user-centred design, which constitutes an approach to design applicable to various domains and which facilitates ways in which user values and practices can be considered in the design process (Redström, 2006)

The potentially most thorough extension of the theoretical foundation of the persuasive technology field, is brought about by Oinas-Kukkonen and Harjumaa in 2008 as they elaborate on the notion of persuasive technologies by including theoretical perspectives from a range of persuasion experts (H. Oinas-Kukkonen, Harjumaa, M., 2008). Persuasive technology is approached from a distinct system oriented perspective, yet the perception of persuasion is grounded in theories of information processing, cognition and persuasive strategies and techniques.

By extending the theoretical foundation and focusing on persuasive system design, Oinas-Kukkonen et.al. also distinguish their perspectives from Fogg both in theory and in practice. Included in this distinction is a broader understanding of persuasion, as extended from the intention to change attitudes and behaviour, to also address shaping or reinforcing intended behaviours (H. Oinas-Kukkonen, Harjumaa, M., 2008). This particular extension of the definition of persuasion, is based on references to social psychologist Gerald Miller (Miller, 2002).

Miller provides an insightful state of the art of persuasion, striving to provide a broad definition on the concept of “being persuaded” (Miller, 2002). Agreeing with Fogg, Miller describes persuasion as the act of influencing others without use of coercion or deception, also stressing that persuasion can be considered the more ethical approach to influencing others. Miller’s thorough elaboration on different theoretical perspectives on persuasion, leads to the distinction between three different behavioural outcomes: shape, reinforce and change. He furthermore specifies that persuasion is a process, and that it requires a deeper understanding of the given situation and the active decision (Miller, 2002).

I argue that as such, persuasion may to some extent be based on learning. Through the process of acquiring new knowledge (learning), the persuadee is likely to change attitude towards a given subject, and based on this attitude change, subsequently change behaviour (S. Gram-Hansen & T. Ryberg, 2015). Thus, I find that persuasive design distinguishes itself from other approaches to behaviour change, such as Nudging (John, Cotterill, & Richardson, 2011), by striving towards continuous behaviour change, rather than momentary influence.

Even though Miller’s distinctions between different outcomes of persuasion facilitates a more nuanced understanding of persuasion as a concept, I find the division problematic, particularly when considering Redström’s argument that all technologies may to some extent be considered persuasive. As a result, I base much of my understanding of persuasion on Miller’s work, yet agreeing with Fogg’s definition of persuasive technologies as referring solely to technologies which are designed with the intent to *change* attitudes or behaviours.

Another important perspective in the understanding of persuasion, is found when considering classical rhetoric. Fogg refers to Aristotle as he explains the historical development of persuasion as a concept (Fogg, 2003). Although not giving direct credit to rhetoric, Miller also indicates the relevance of looking towards this particular humanistic perspective, as he touches upon an existing debate about the persuasion/conviction

duality (Miller, 2002). This discussion presents the argument that while conviction is based on logical argumentation, persuasion is primarily the result of strategic symbols triggering the emotions of the persuadee. Miller however dismisses the discussion by noting that people are seldom persuaded by pure logic or pure emotion, but rather by a combination, as it is even questionable whether these concepts even exist in a pure form in modern persuasion (Miller, 2002). By doing so, I find it reasonable to relate Millers perception of persuasion, to what is known as the rhetorical appeals.

Within the persuasive technology field, the potential of considering classical rhetoric has been further highlighted by Hasle and Christensen (Hasle & Christensen, 2007). By explaining the inseparability of the rhetorical appeals *logos* (logical argumentation), *pathos* (emotional argumentation) and *ethos* (credibility), Hasle and Christensen support Millers dismissal of the conviction/persuasion duality debate, and furthermore extend the understanding of persuasion as a concept, by adding the notion of credibility to the equation. Hasle and Christensen furthermore argue that although modern day persuasion is very often explained in relation to social psychology, the notion of persuasion as well as the term itself may be linked to classical rhetoric and based on the work of Aristotle (Hasle & Christensen, 2007).

In my perspective, classical rhetoric can contribute to a more nuanced understanding of persuasion as a concept. At a general level, classical rhetoric considered communication and art as well as a strategic action with the intent to win over one's audience. However, in order for a speech to be considered beautiful and "artistic", it had to not only be efficient and well delivered but also truthful (Lindhardt, 2003).

My particular interest in the contributions from classical rhetoric is directed towards the concept of *Kairos*. In classical rhetoric, *Kairos* refers to the opportune moment for a persuasive initiative to take place, in order to ensure its success. It is most often referred to as timing, however the concept combines the appropriate time with considerations regarding the appropriate place and manner of the action. As was the case with the rhetorical appeals, the three dimensions are inseparable and must be all be considered and balanced in accordance with the persuasive intention (Benedikt, 2002; Kinneavy, 2002).

Moreover, *Kairos* is multidimensional and should be considered both as a wider and more contextual perspective, as well as a narrower and more specific perspective (J. B. Hansen, 2009). Whilst the latter may provide insights regarding specific moments in time in which e.g. a mobile app may

successfully intervene, the wider understanding of Kairos bids us to reflect more thoroughly on the intended use context and on appropriateness within this context.

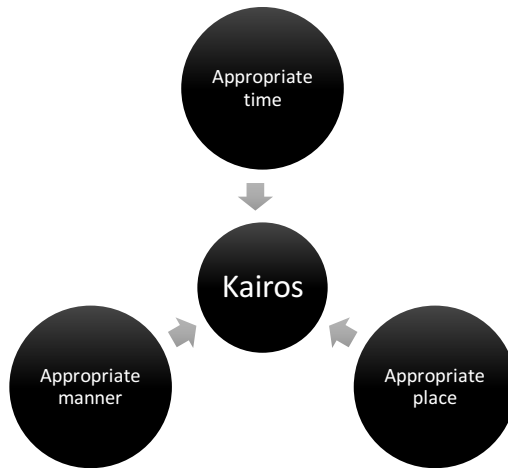


Figure 3 – Kairos, comprised by the appropriate time, manner and place

With a distinct focus on appropriateness, Kairos not only facilitates reflections regarding the intended use context and e.g. timing and location specifics within the persuasive systems. I also find it to provide important indications regarding the ethical and methodological perspectives related to persuasive design.

The notion of appropriateness itself underlines the importance of ethical reflections, as that which is appropriate in one situation may not be in another. In relation to persuasive design, this leads to the understanding that persuasive initiatives that are efficient in one context, may not be so in another. Persuasive initiatives must be designed in consideration of the intended use context and also in the appropriate manner as perceived by the user. Moreover, in my interpretation, Kairos indicates that participatory design may be a requisite to persuasive design, due to the element of appropriate manner. Whilst designers may be able to determine the appropriate time and place for a persuasive initiative to take place, the appropriate manner is based on the user's understanding of the context. As a result, user's must be considered throughout the design process, and acknowledged as experts equally to the designers (S. B. Gram-Hansen, 2016).

From this understanding of the implications of Kairos, the following sections will elaborate on both the ethical and methodological tendencies within the persuasive technology field.

ON THE ROLE OF ETHICS IN PERSUASIVE DESIGN

Ethics in itself may be defined as a critical reflection regarding our perceptions on appropriate human behaviour and way of life - a reflection which becomes even more relevant in situations where the answer is not obvious (S. Andersen, 2003).

The mere notion of designing technologies with the intent to change a person's attitude or behaviour, gives reason to carefully consider the ethical implication of the intention, the design process, and the consequences of implementation. Fogg briefly initiated the ethical discussions within the field, by addressing the question regarding whether or not persuasion in itself may be considered unethical. He reached the understanding that the ethics of persuasive technology was highly dependent on the context in which the technology was implemented, and on who was evaluating the technology (Fogg, 2003).

Although Fogg's inclusion of ethical reflections helped indicate that ethics should be a considered perspective within the persuasive technology field, I find that the discussion itself and the questions raised are to some extent irrelevant. As it has been established that we can in fact design technologies which change the users, it may be more fruitful to focus on how to ensure that persuasive technologies are designed as ethically as possible, rather than debating whether or not persuasion is ethical. Firstly, because as Fogg rightfully concludes – the answer to the debate depends on the perspectives of the evaluator, and secondly, even if persuasion was found to be unethical, there is no actual chance that designers will stop striving to influence users through their designs.

In spite of being a subject of some attention when the persuasive technology field was first established, ethics remains a scarcely addressed theme as the field has developed. Oinas-Kukkonen and Törning found that out of the 51 papers included in their review of the field, only three papers included a longer discussion of ethics. Subsequently, their recommendations for future research included a stronger emphasis on ethical perspectives in relation to persuasive system design (Törning & Oinas-Kukkonen, 2009). As I conducted my own review, I found that ethical perspectives are continuously only briefly included in the published papers, and that very few papers provide directions for researchers and practitioners to include ethical perspectives in their work.

The lack of more in-depth ethical reflections from Fogg, comprised one of the main areas of critique in Atkinson's critical review of Fogg's work in 2006 (Atkinson, 2006). Firstly, Atkinson addressed the problem that although Fogg portends to focus on end users, his work entirely disregards the potential of user involvement in the design, test, and evaluation of persuasive technologies. In reality, the perspectives presented are designer- and system-centred, which is particularly problematic as Fogg also states that unintended behaviour changing outcomes are not regarded as persuasive technologies. Atkinson argues that responsible users-centred designers would consider both the intended and unintended outcomes (Atkinson, 2006). Moreover, Atkinson argued that in order for persuasive technologies to be ethical, some level of transparency was required, in the sense that the users must be informed about the persuasive intention of the technology. The importance of transparency is furthermore elaborated on by Berdichevsky and Neuenschwander who argue that persuasion must not misinform, and that ethical evaluations must include both the intent of the designer and the consequences of implementation (Berdichevsky & Neuenschwander, 1999).

In my perspective, and particularly in relation to my reflections regarding the implications of Kairos, I find that the issue of transparency, may to some extent be related to the element of appropriate manner. In order for a persuasive technology to be both efficient and ethical, there must be an alignment between the intentions of the designer and that of the user. E.g. persuasive technologies such as activity trackers are only persuasive when they are worn by users who share the intent to become more active. Likewise, mobile apps designed with the intention to motivate the user to stop smoking, are only successful if the user shares the intention to stop. If the intentions are not balanced, the system prompts to "start walking" or "don't smoke now", will be received by the user as annoying or simply inappropriate.

Following up on Atkinson's critique of Fogg's lack of user-centred perspectives, Janet Davis introduced Value Sensitive Design (VSD) and Participatory Design as methodological approaches which could potentially help overcome some of the challenges related to persuasive design (Davis, 2009).

Value sensitive design, is a methodological approach to design, that seeks to encompass human values throughout the design process (Friedman & Kahn, 2003). While building on several different perspectives on ethics in technology design, such as Computer ethics and Social informatics, Participatory Design is highlighted as an approach to design which particularly facilitates the inclusion of democratic values in design

processes (Albrechtslund, 2007). According to Davis, VSD holds potential in relation to persuasive technology for several reasons. Firstly, due to the interactional perspective in VSD which corresponds well with the notion of persuasive technologies, and secondly due to wide-ranging methods for stakeholder and value analysis. Davis argues that VSD facilitates a shift in attention from the potential harm of a technology, to the values of the users (Davis, 2009). Subsequently, Davis points towards participatory design as a promising direction for persuasive design, partly due to participatory design activities promoting a sense of ownership among the technology users, and partly as the co-creative process, along with the acknowledgement of domain expertise amongst the technology users, facilitates a more in depth understanding of the intended use context (Davis, 2009).

From my perspective, considering participatory design in relation to persuasive design, is not only promising, it is a necessity. As previously mentioned, the importance of acknowledging the users as domain experts may also be considered in relation to Kairos. Here participatory design may facilitate the consideration of all three elements of the concept and thereby enable the designer to fully grasp the opportune moment through the design of persuasive technologies.

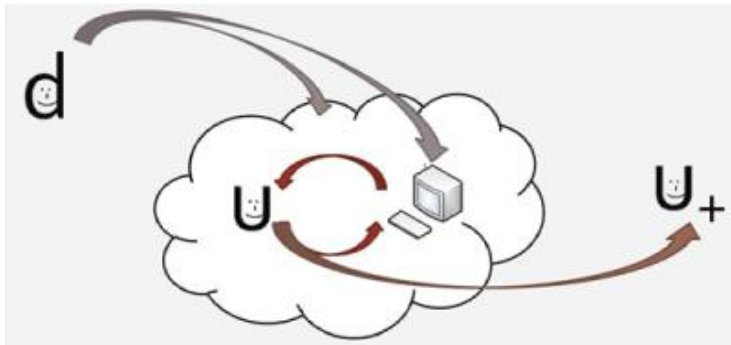


Figure 4 - Visualisation of ethical perspectives

Traditionally, ethics is approached from two opposite directions. The utilitarian, which evaluates an action based on the consequences of its use, and the deontological approach which relates to the ethical duty of the actor, and seeks to construct rules and maxims by which all actors should abide. Persuasive technologies spring from the designer's intent to change the user's attitude or behaviour, and as such the ethicality of the intention itself must be evaluated – this may be related to deontological ethics. Once a technology is implemented in the intended context, it holds the potential to change the user's attitude or behaviour – depending on whether a

balance is established between the designer's intentions and those of the user's. At this point the utilitarian approach to ethics is usually applied. The relation between different ethical traditions is visualized in Figure 4,

However, Albrechtslund has argued that the traditional utilitarian evaluation methods are not necessarily sufficient, as designers cannot be held accountable for unintended use of a technology (Albrechtslund, 2007). Users are not lemmings, but have a tendency to apply technologies in ways that go far beyond what might be anticipated by the designers. As a result, Albrechtslund also promotes VSD as a promising perspective on technology design.

While agreeing with Albrechtslund, on the insufficiency of the utilitarian approach, my attention is also directed towards the fact that neither the utilitarian, nor the deontological perspective promote reflections regarding use context. Moreover, when considering ethics strictly as a perspective for evaluation, it tends to become a deconstructive element in the design process, rather than a facilitator of *appropriate* design solutions. As I consider Kairos a key concept to persuasion, I also reach the understanding that ethics is not only an important element in persuasive design, it is in fact a defining feature. While other similar approaches to behaviour design, such as nudging (P. G. Hansen & Jespersen, 2013), do not disregard ethics, they do not share the perspectives on transparency as opposed to coercion.

Hence, I find that VSD and more particularly Participatory design enables designers to also include a third ethical perspective in terms of ontological ethics. For this, I include the ethical perspective of Danish philosopher and theologian K.E. Løgstrup (Løgstrup, 1997). Løgstrup argues that ethics is based on intuition rather than reason, and that our perception of ethics is dependent on our social reality and our interactions with others. Most often, Løgstrup's ontological ethics is disregarded as the understanding of ethics as being intuitive precludes it from being applied in evaluation. That which is ethical for one person may be considered entirely unethical by another (S. B. Gram-Hansen, 2009). However, when considering Løgstrup's perspectives on interaction, power relations, and sovereign expressions of life, he enables ethics to be considered constructively in the design processes (S. B. Gram-Hansen & T. Ryberg, 2015).

Løgstrup's approach to ethics distinguishes itself from e.g. utilitarianism, by being based on intuition, rather than being based on reason. The intuitive nature of the approach makes it inapplicable for evaluation purposes. However, I argue that the perspectives presented regarding human interaction, hold much potential as a guideline for planning and

executing participatory design activities. Løgstrup argues that features such as benevolence, compassion, trust, love, and open speech, constitutes features which all humans are born with, and that showing compassion and caring for other humans is simply part of our nature. He refers to this as *the ethical demand* (Løgstrup, 1997). The spontaneous manifestations of life can as such be considered the features within human nature which are generally viewed as ethical – as opposed to characteristics such as jealousy, hate, mistrust and injustice (S. B. Gram-Hansen, 2009).

My particular interest in Løgstrup is based on his argument that people are inevitably entangled, and as such, ontologically connected through our interactions. The way we meet other human beings influence them and the way they subsequently meet other people.

“Trust is not of our own making; it is given. Our life is so constituted that it cannot be lived except as one person lays him or herself open to another person and puts him or herself into that person’s hands either by showing or claiming trust. By our very attitude to another we help to shape that person’s world. By our attitude to the other person we help to determine the scope and hue of his or her world; we make it large or small, bright or drab, rich or dull, threatening or secure. We help to shape his or her world not by theories and views but by our very attitude towards him or her. Herein lies the unarticulated and one might say anonymous demand that we take care of the life which trust has placed in our hands”

(Løgstrup, 1997)

In my perspective, Løgstrup’s considerations regarding the influence we have on each other, both during interaction, but also subsequently as we proceed on with our lives, may serve as a valuable perspective in relation to participatory design. Not only does the sovereign expressions of life suggest directions for establishing a mutual power balance between the interacting participants. The understanding of the ontological entanglement gives reason to assume that a successfully balanced interaction between participants may facilitate the further consideration of user values throughout the design process. Just as our attitude towards others may help shape a person’s world, the open interaction, freedom of speech and open trust may facilitate the establishment of a mutual understanding between participants.

METHODS FOR PERSUASIVE DESIGN

As previously mentioned, the state of the art conducted by Torning and Oinas-Kukkonen not only provided an overview of the field at current state, it also led to a number of distinct areas for future research (Torning & Oinas-Kukkonen, 2009). Amongst these were the need for more empirically tested methodological approaches to developing persuasive technologies. As I conducted my own review of the papers published within the field, I identified a tendency within the field to focus on either user-centred approaches or very distinct system oriented methods.

Besides from being a strong promoter of VSD and participatory design, Davis has also contributed to the field with several empirically based papers exemplifying ways in which user-centred methods may be applied in relation to persuasive design. Davis refers to generally applicable methods such as Future workshops (Jungk, 1987) and Inspiration Card Workshops (Halskov & Dalsgaard, 2006), and demonstrates their relevance and validity in relation to persuasion through practical application (Davis, 2008, 2009, 2010).

Still within the user-centred design perspective, Dan Lockton developed the Design with Intent toolkit – a card set which facilitates the communication during the design process, and which focuses specifically on establishing the intentions behind the technology being created (Lockton, Harrison, & Stanton, 2010). Although not limited to persuasive intentions, Lockton's toolkit constitutes the only user-centred methodology developed within the persuasive technology field.

Along the lines of human-centred approaches to persuasive design, Fogg has presented several conceptual frameworks for understanding and reflecting on persuasive technologies. Fogg's behaviour model indicates the relation between mobility and motivation, and argues towards the necessity of *triggers* to make the user take the actual step towards a new behaviour (Fogg, 2009a). Also in 2009, Fogg published an eight step guide for designing persuasive technologies, which in spite of its title and presentation, primarily constitutes a conceptual framework for practitioners and users (Fogg, 2009b). A third and final framework was presented the following year, as a behaviour grid mapping out 15 different ways for behaviour change to take place (Fogg, 2010). The Behaviour grid was initially subject to much critique, as it also suggested that persuasive principles could be mapped to the different types of behaviour change, thus easing the process of identifying which persuasive initiatives would be efficient to a given intention. As such, the behaviour grid conflicted with the general understanding that the intended use context is a key element

in the design, and that what is persuasive in one context cannot necessarily be transferred to another – not even if the intentions are identical.



















	GREEN Do new behavior	BLUE Do familiar behavior	PURPLE Increase behavior intensity	GRAY Decrease behavior intensity	BLACK Stop existing behavior
 DOT One time	 GREEN DOT Do a new behavior one time	 BLUE DOT Do familiar behavior one time	 PURPLE DOT Increase behavior one time	 GRAY DOT Decrease behavior one time	 BLACK DOT Stop behavior one time
 SPAN Period of time	 GREEN SPAN Do behavior for a period of time	 BLUE SPAN Maintain behavior for a period of time	 PURPLE SPAN Increase behavior for a period of time	 GRAY SPAN Decrease behavior for a period of time	 BLACK SPAN Stop behavior for a period of time
 PATH From now on	 GREEN PATH Do new behavior from now on	 BLUE PATH Maintain behavior from now on	 PURPLE PATH Increase behavior from now on	 GRAY PATH Decrease behavior from now on	 BLACK PATH Stop behavior from now on

Figure 5 - Fogg's behaviour grid

In spite of the critique of Fogg's behaviour grid, I find that the mapping of different behaviour change types is in fact a valuable tool for reflecting upon the intention of a design, and subsequently the choice of appropriate method. Fogg at the time focused on behaviour change at a more general level than just persuasion, and as such, the grid includes both momentary and continuous behaviour changes. Consequently, when collaborating with participants who are non-experts with regards to behaviour change, the grid may be used to facilitate the dialogue about e.g. nudging vs persuasive design. Interpreting the grid requires no theoretical expertise, but enables participants to reflect upon the behaviour change type and duration.

Nudging is argued to facilitate behaviour change by organizing the context in a manner by which some choices are made more obvious than others. The approach draws upon what Kahneman refers to as fast thinking (Kahneman, 2011) and which is described by Thaler and Sunstein as the

automatic system of information processing (Thaler & Sunstein, 2009). The automatic system operates in an intuitive, automatic and mostly unconscious manner, without rational processing of the situation. Hence, nudges are solely efficient within the context where they are applied, and do only motivate momentary behaviour change. In my interpretation of the behaviour grid, this corresponds to what Fogg refers to as a Dot behaviour, whilst Persuasion as previously stated, constitutes a transparent process in which the user is aware of and actively engaged in the behaviour change.

Although user-centred approaches to design are recognised, the predominant method developed within the field is the Persuasive System Design model, developed by Harri Oinas-Kukkonen et.al (H. Oinas-Kukkonen & Harjumaa, 2008). Opposed to the methods presented by Davis and Lockton, the PSD model constitutes an expert driven, system oriented approach to designing persuasive technologies. The method springs from the persuasive principles originally presented by Fogg in the Functional Triad (Fogg, 2003), yet strives to categorize them in accordance with the system tasks which they may be related to (H. Oinas-Kukkonen & Harjumaa, 2009).

An important benefit of the PSD model is that it has been based on a thorough investigation of different perspectives on persuasion, and was the first framework to refer to Miller's perspectives. Moreover, the PSD model does include reflections regarding the intended use context. None the less, I found it to be a significant limitation, that the framework was based on Fogg's persuasive principles. Several researchers have aimed to apply Fogg's principles as guidelines for further development of technologies within more established research fields – including myself when I participated in the PLOT project. However, as the principles are not novel, they also do not lead to new ways of designing technologies. In fact, many of the principles have already been described to great extent but under other names through e.g. information architecture (Lykke, 2009). Consequently, I initially found that although the PSD model has been established as a useful tool for evaluating persuasive systems (H. Oinas-Kukkonen & Harjumaa, 2008), it did not hold much promise as a tool for generating design directions.

To further reflect upon what appears to be two distinct methodological directions within the persuasive technology field, I found it relevant to refer to Sanders' Design landscape.

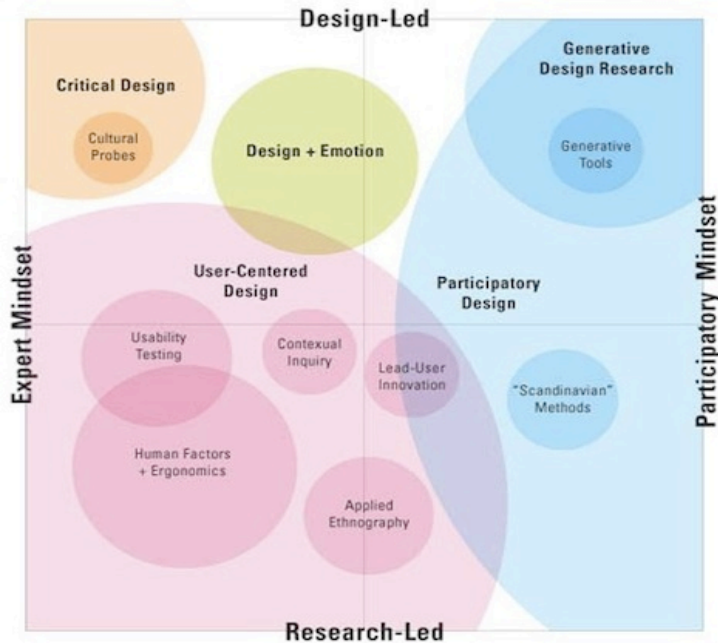


Figure 6 - Sanders Design Landscape (Sanders, 2008)

The Design Landscape is based on Sanders's identification of an overall shift in perspective in the practice of design, spanning from expert driven approaches to a participatory mindset. The general line of thought is that all people may offer something to a given design process when given the appropriate tools to express themselves. (Sanders, 2002, p. 2)

While several of the methods described in the previous sections may be identified as being based on a participatory mindset, particularly those referenced by Davis and Lockton, the PSD model distinguishes itself by being predominantly expert driven. In consideration that the nature of persuasive technologies is to mediate the designer's intentions towards the users and thus facilitate the user's behaviour change process, the expert driven perspective does have its validity in relation to persuasive technologies. However as previously mentioned, the rhetorical notion of Kairos also promotes a distinct claim for participatory design in order to establish the appropriate manner of a persuasive initiative. The dimensions of Kairos are inseparable, and consequently, I find that an essential element in further development of persuasive design methodologies include methods which bridge between the expert driven and participatory mindset, so that both approaches may be acknowledged equally.

SUMMING UP

In accordance with the perspectives presented by Redström (Redström, 2006), I approach persuasive design as a meta perspective which may be applied in various more established fields, and contribute with concepts and perspectives which focus particularly on motivating and engaging the users. My understanding of persuasion as a concept, predominantly draws upon Miller (Miller, 2002), although acknowledging that his perspective challenges the unique claim of persuasive design.

In consideration of the rhetorical notion of Kairos, and in particular the multidimensional understanding of the concept, I distinguish between persuasive design and persuasive technologies. Whilst I apply the term persuasive technology to refer to the distinct digital persuasive system, I refer to persuasive design as a wider and more context oriented perspective. In order for the persuasive technology to be efficient, there must be a balance established between the intentions of the designer and those of the user. With this particular distinction, my understanding of persuasive design, distinguishes itself from other more behaviouristic perceptions of the concept. In my interpretation, persuasive design does not aim to manipulate the user into changing behaviour, but to facilitate a behaviour change already intended by the user. Hence, the application of participatory design expands from focusing on establishing the user's perception of appropriate manner, to also focus on establishing what behaviour change the persuasive technology should strive to facilitate.

Moreover, in consideration of the inseparable dimensions of Kairos the persuasive technology must be implemented within the intended use context and in a way which establishes an appropriate balance between the technology and the context. In my perception, I consider persuasive design to be an approach to behaviour change which acknowledges and combines the technological and contextual perspectives, in order to establish such a balance. Persuasive design distinguishes itself from other approaches to behaviour change by striving towards continuous (sustainable) attitude and behaviour changes and by considering ethics throughout the design process.

The perspectives on persuasive technology presented in this chapter, and in particular the different dimensions of Kairos, constitutes the basis of paper number 1 included in this Ph.D. dissertation. In the paper *Persuasion, Learning and Context Adaptation*, I took my first steps towards distancing myself not only from Fogg's theoretical framework, but to some extent also from the distinct system oriented perspectives presented by Oinas-Kukkonen and Harjumaa. Although not referring to

him at the time, I found myself agreeing more with the suggestions made by Redström, that persuasive design should be considered an approach to design which could be brought into consideration in other more established fields, providing them with perspectives on creating engaging, motivating, and behaviour changing designs.

My understanding of ethics in relation to persuasive design, is further elaborated upon in paper number 2 and 3 also included in this dissertation. In paper number 2 *On the role of ethics in persuasive design*, I address the challenge of constituting a distinct claim of persuasive design, in relation to other more established research fields and argue that ethics should be considered a defining element.

In paper number 3 *From Participatory Design and Ontological Ethics, towards an approach to Constructive Ethics*, I extend my perception on ethics by exemplifying how Løgstrup's ontological ethics may be considered as a guiding factor in planning and executing participatory design activities. This paper is based upon research conducted during my collaboration with the Danish Defence Estate and Infrastructure Organisation (DDEIO).

Although the primary focus within DDEIO is directed towards sustainable optimization of the different facilities, the relevance of considering human factors as part of their green transition is also acknowledged. Although many Defence Command employees recognize the importance of a sustainability perspective at a general level, most fail to behave accordingly. Consequently, the theoretical perspectives which have been presented and discussed in this chapter, were put to practice as I contributed to the development of persuasive learning designs, intended to educate and motivate conscripts in the Danish army to adapt a more sustainable attitude and behaviour. Further details on this collaboration, as well as the design process leading to the development of persuasive learning designs, are presented and discussed in the following chapters.

CHAPTER 4. RESEARCH DESIGN

Amongst the themes highlighted by previously referenced Torning and Oinas-Kukkonen was the lack of empirically proven models or methods for developing persuasive designs (Torning & Oinas-Kukkonen, 2009). Much research within the field at that time was theoretically based, or conducted in restricted environments, and methodological approaches to persuasive technologies and persuasive design were very few and scarcely empirically tested.

From my own state of the art presented in the previous chapter, I found that not much has changed. Of the entire body of research published in the eight years included in my review, only very few researchers have focused on extending the methodological foundation for persuasive designs. The lack of empirically tested methods imposes a particular challenge when acknowledging that persuasion requires considerations regarding the opportune moment, and that persuasive initiatives are only efficient when implemented in the intended use context.

Consequently, as I embarked upon my collaboration with the Danish Defence Estate and Infrastructure Organisation (DDEIO), the interest of my research extended from focusing on the correlation between learning and persuasion, to also include a distinct interest in exploring the components of a new design process. This process would equally acknowledge both the user-centred and system-oriented perspectives that had been identified as relevant within the persuasive technology research field.

In this fourth chapter, I move on from my literature research, towards a practical exemplification of persuasive design applied in the education context of conscripts in the Danish army. In the following, I broadly introduce Defence Command Denmark and the case related significances that have influenced my approach to the research and design collaboration. Subsequently, I present my research design and methods, with particular focus directed towards the activities that required user involvement and/or participation, along with a brief introduction to my use of ethical perspectives as a constructive perspective in the design process.

COLLABORATING WITH THE DEFENCE COMMAND DENMARK

According to the Ministry of Defence, the primary goal and task of Defence Command Denmark, is to:

- Prevent conflicts of war
- Assert Denmark's sovereignty and ensure its continued existence and integrity
- Promote peaceful development in the world, with respect for human rights⁵.

These goals – and the defence command name itself – indicate that the Danish military does not engage actively with offensive forces in international conflicts, but instead obtains a role as peacekeeper in regions recovering from war. Consequently, the tasks handled by the different forces of the defence command range from participation in international operations to protecting Danish territory. Moreover, the forces are involved in a large number of civilian tasks, such as environmental surveillance, preventing pollution, fisheries inspection and disaster management.

One of the primary activities of the defence command, is to educate and train military staff, so that they are well prepared for the variety of tasks they may face. This includes educating new soldiers for the different forces, further training and education of current soldiers, and education of staff for various non-military positions such as logistics, communications, mechanics, and sanitation. As such, the defence command may be considered a particular type of educational institution, in which young men and women are educated to become part of the military organization.

As the government agency under the Danish Ministry of Defence, the DDEIO is in charge of maintaining and developing the Danish Defence Command establishments. This includes all military buildings as well as all nature resorts and forests owned by the Danish Defence Command that are typically used for military training in terrain. Moreover, the DDEIO is in charge of all energy and environment issues and initiatives within the Danish Defence Command, including energy and environment education, climate communication both internally and externally, and climate related disaster management.

My collaboration with the DDEIO was, as mentioned in the introduction, initiated in 2012 when I was asked to facilitate a persuasive design workshop. The workshop included representatives from each of the three military services; Army, Naval Force, and Air Force, along with representatives from the DDEIO management and from the graphic

⁵ <http://www2.forsvaret.dk/eng/About/Pages/About.aspx>

design company *Det Nye Sort*, who were providing marketing consultancy and graphic design for the DDEIO (Appendix A).

At the time, the DDEIO were taking their first steps into their large scale 3 year project Green Army Barracks ⁶, in which they sought to explore ways to meet some of the ambitious climate strategies set by the Danish Ministry of Defence (Ministry of Defence, 2012a) by optimizing the energy sufficiency of two Danish army barracks. A central element in this project was a competition for architects with expertise in energy optimization, in which contestants were invited to provide innovative solutions for new army barracks. Two highly diverse army barracks were chosen as pilot testing venues for the project, namely Almegaard Kaserne on Bornholm, and Aalborg Kaserne in Northern Jutland. Almegaard Kaserne on the island of Bornholm represents one of the oldest army establishments in Denmark, where listed buildings are still being used, and where any changes must be done in accordance with the rules of building preservation. Aalborg Kaserne on the other hand represents one of the largest military establishments in Denmark, and is also one of the largest workplaces in the region.

A generally increased focus on climate related issues in the Danish Defence Command, along with a distinct need to communicate Project Green Army Barracks internally within the defence command organization, had resulted in some frustration for the DDEIO. *Det Nye Sort* had been brought in as graphic designers and communication consultants, however, through this collaboration it had become increasingly clear that the complexity of the command organization along with a unique culture both within different the forces individually and across the organization, made such a collaboration immensely complicated. In spite of pleasant meetings and impressive graphical skills of the consultants, it had not been possible to reach a mutual understanding of a graphic expression, which was both efficient and appropriate in consideration of both Defence Command standards and the culture within the organization.

In order to facilitate the establishment of a mutual understanding of the communication strategy and the intended use context, I facilitated a full day workshop, which as previously mentioned involved a variety of participants. The aim of the workshop was partly to ensure that *Det Nye Sort* gained a better understanding of the military context, but also for the

6

<http://www2.forsvaret.dk/temaer/groenneetablissementer/Pages/Groenneetablissementer.aspx>

DDEIO to gain a better understanding of the military staff's attitudes towards green transitioning (Appendix A).

On my account, the workshop served as a springboard for a more established collaboration with the DDEIO, as discussions during the workshop helped them reach the understanding that green transition was dependent on the combination of improved military establishments, and attitude and behaviour changes amongst the military staff. On the basis of this initial workshop it was agreed that whilst project Green Army Barracks would focus on energy optimization of the aforementioned army barracks, I would collaborate with the DDEIO on behaviour changing initiatives directed towards the users of the same two barracks.

More specifically, I agreed to collaborate with DDEIO representative Thilde Møller Larsen in designing, implementing and testing persuasive design initiatives in either one or both of the two pilot army barracks. Thilde Møller Larsen is campaign manager and primary manager of all green communication both within the defence command organization and beyond. With her position in the DDEIO, she was able to not only provide me with whatever information I required, she was also able to ensure my access to locations and employees within the defence command organization, which would otherwise have been hard to obtain.

RESEARCH DESIGN

In all simplicity, the goal of a research design, is to ensure that the methods applied and the data collected enables the researcher to answer the research questions. As such, the research design refers to the procedures of inquiry and to the combination of research methods applied both in the data collection process and in the subsequent data analysis. With reference to Creswell, my selected research approach is greatly based on the nature of the problem, which I am exploring, but also on my personal experiences as a researcher (Creswell, 2014).

Similar to the PLOT project, my collaboration with the defence command strived to apply persuasive design in a particular type of educational institution, with very distinct learning contexts. Having experienced this to be a challenge in the PLOT project, a natural first step was to extend my knowledge on the relation between persuasive design and learning, by looking towards the experiences made by others.

Nevertheless, as I re-examined the papers included in the literature review described in Chapter 3, I found that although several researchers reference Miller as they describe "Persuasion as a process" (Iversen &

Pertou, 2008; Miller, 2002; H. Oinas-Kukkonen & Harjumaa, 2008), only two papers had been published with a distinct focus on persuasive technologies applied in a learning environment. Firstly, in 2006, persuasive design principles were applied in the development of a learning system, which aimed to motivate children to read and write. Conclusions of the study was that the system appeared successful although long term effects had not been identified at the time, and moreover, that acknowledgement of individual differences and a distinct effort to meet the learners at their level was fundamental (Lucero et al., 2006). Secondly, in 2012, persuasion was discussed in relation to reflective learning. Besides from identifying an overlap between persuasive reinforcement and reflective learning, it was argued that motivating the user to reflect on past experiences had potential in relation to behaviour change systems (Müller et al., 2012). Overall, although both papers present perspectives that required my consideration, the wider potential of applying persuasive design in learning remained unexplored.

Consequently, my overall research design may be defined as exploratory, in the sense that I do not aim to provide conclusive answers, but to explore the topic – the cross field between persuasive design and learning, and the possibility of combining user-centred and system-oriented design methods in the design process, in varying depths. Exploratory design is argued to lead to complex and profound insights, and often lead to recommendations for further research (Shields & Rangarajan, 2013). The approach is often related to case studies, and is in itself less structured than many other research approaches. Consequently, it is most often applied through an explicit research plan, yet with openness towards the unforeseen and unexpected (Shields & Rangarajan, 2013)

The explicit plan was in my case greatly inspired by Design Based Research (DBR) also known as Design Research, which is a methodological framework most often traced back to the work of Ann Brown (Brown, 1992) and Alan Collins (Collins, 1992). As a research methodology, DBR, is based upon the understanding that *context matters* when it comes to learning and cognition, and that research which explore learning designs and learning processes in isolated variables or in contexts beyond the intended, will fail to provide a complete understanding of their potential in a natural setting (Barab & Squire, 2004).

In the acknowledgement that my own experience with research in educational settings was limited, I found it fitting to look towards established research methodologies within the learning domain to identify a framework for my own research. When introduced to DBR, I found that the aforementioned contextual orientation of the methodology made this

approach particularly suitable, as the distinct contextual focus on the intended use context corresponds well to my approach to persuasive design as well as my considerations regarding Kairos.

Moreover, the overall goal when applying DBR is not alone to improve educational practice, but also to extend theoretical perspectives and generate design principles and methods for improving both the practice and research within educational contexts (T. Andersen & Shattuck, 2012). Consequently, DBR constitutes a framework, which could not alone facilitate the development of persuasive designs for the DDEIO, but also serve as framework for my own research in the theoretical cross field between persuasive design and learning, and my aim to generate methodological principles for persuasive design.

The DBR approach does not classify as a set scientific method, but rather as a methodology which draws upon mixed method approaches and thus combines quantitative and qualitative research methods (Collective, 2003). When also considering that it is a distinct feature of DBR that research is conducted within the intended learning context, DBR becomes a *“lens for understanding how theoretical claims about teaching and learning may be transformed into effective learning in educational settings”* (Collective, 2003)

The combination of mixed methods and the involvement of both researchers and practitioners in DBR are factors, which are likely to facilitate the successful outcome. However, the methodology is also faced with some critique, for instance with regards to the objectivity of the researcher, and his or her ability to remain unbiased when engaged so deeply in the context. Anderson and Shattuck argue that this particular critique is familiar to many forms of qualitative research, but that the inside knowledge acquired by actively engaging in the context adds as much validity as may be detracted from the potential bias of the researcher (T. Andersen & Shattuck, 2012). Good research is argued to always require scepticism, commitment and detachment. However, when applying DBR, comradeship, enthusiasm and a willingness to actively support the process and intervention is considered equally important (T. Andersen & Shattuck, 2012).

In my further understanding of the DBR approach I refer to Amiel and Reeves, who visualises DBR as a four phased model comprising an iterative process through which problems are analysed and identified in collaboration between researchers and domain experts (Amiel & Reeves, 2008; Reeves, 2006). Solutions are designed on the basis of existing principles and innovative technologies, implementation in itself is

iterative and focused on solution refinement, and finally the solution is evaluated with a distinct focus on extending the theoretical and practical foundation and principles for future development.

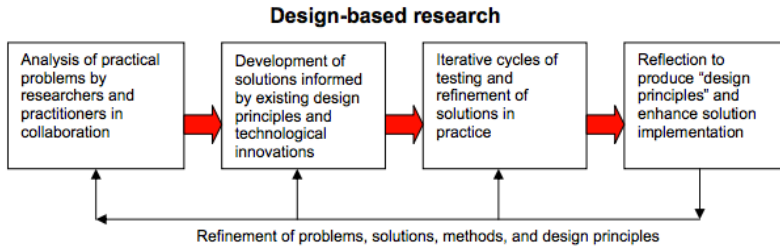


Figure 7 - The four phase DBR process (Amiel & Reeves, 2008)

Reeves and Amiel recommend that the DBR process is initiated by a negotiation of research goals between practitioners and researchers as visualized in the first step of the DBR model in Figure 6 (Amiel & Reeves, 2008). From the very beginning, the practitioner is considered a valuable partner in the process of establishing research questions and identifying the problems related to the investigation. Once this is done, a learning design for the intended context, which focuses on addressing the identified problems is suggested. Both the development phase and the iterative cycles of test and refinement call for a humble approach by the researchers, and a recognition of the complications which occur in real world environments (Amiel & Reeves, 2008). The outcome of a DBR process is suggested to be new design principles or guidelines for future design processes. Such guidelines are expected to be empirically based and richly described.

The particular focus on collaboration between practitioners and researchers composes a third reason why I found DBR to hold particular potential in relation to persuasive design. As previously mentioned, I find that considering the three dimensions of Kairos in a design process calls for a participatory mindset. Although the DBR framework does not distinctly refer to participatory design, the collaborative perspective does indicate that the approach to design should be user-centred at the least. Amiel and Reeves describe how problems are identified in collaboration between researchers and practitioners, along with the clarification that researchers and practitioners are required to engage in a long term collaboration throughout the design process (Amiel & Reeves, 2008). While not an explicit claim in DBR literature, I find that the DBR framework could also adopt a participatory mindset with advantage.

Whereas my overall understanding of DBR as being a four phased research process is inspired by Reeves, I extend my understanding of the individual phases by also including perspectives from the DBR Innovation Model (Christensen, Gynther, & Petersen, 2012). The DBR Innovation Model adds to the work of Reeves, by elaborating on different types of research activities and goals, which may be naturally related to the different phases of the DBR research process.

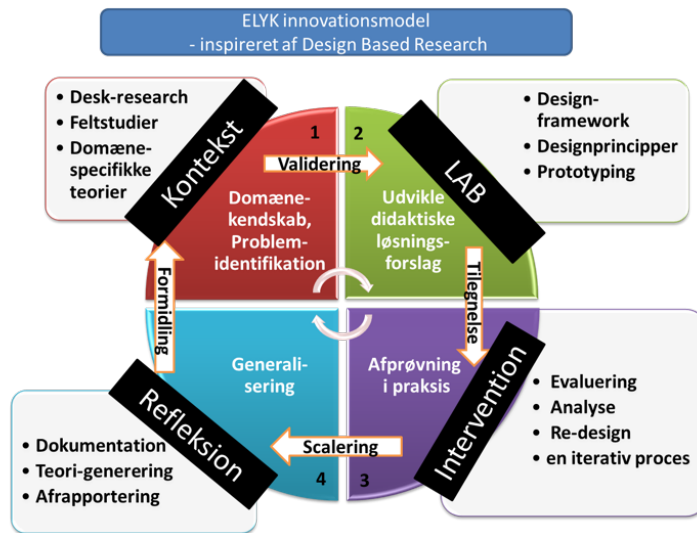


Figure 8 · The DBR Innovation Model (Christensen et al., 2012)

Where Reeves does not provide distinct directions with regards to methods and activities within the different phases, Christensen et al. state that problem identification in traditional DBR projects are most often based on desk research which is subsequently discussed with practitioners. The innovation model suggests that the first phase of the process should be extended to also include field work, and that focus should be on identifying innovation potential within the context, rather than problems (Christensen et al., 2012). Similar recommendations are made for the following phases of the process, e.g. workshops are recommended for the development of learning designs in the Lab phase.

In my adaptation of the DBR framework, I found myself drawing upon both Reeves and Christensen, in the establishment of a research framework that was applicable both in consideration of the research to be conducted and the collaboration with the DDEIO. More distinctly, I draw upon Reeves' general reflections regarding collaboration and the role of the

researcher, yet look towards Christensen et al. for inspiration regarding the methods and techniques to apply in the individual phases. Hence, my merging of the two frameworks may be visualised as follows:

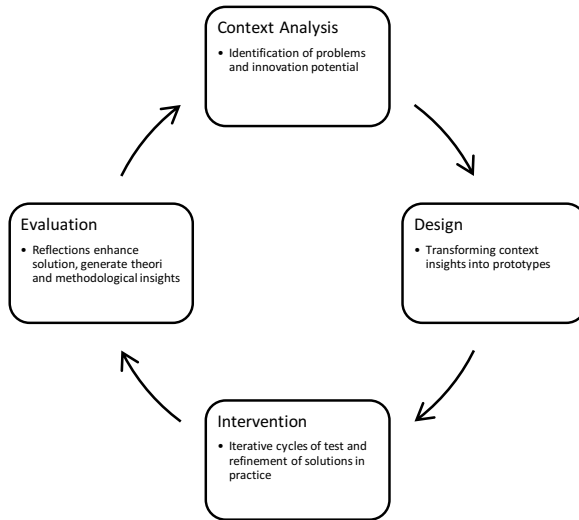


Figure 9 - Adaptation of DBR process, based on Reeves and Christensen et.al.

In practice, my application of DBR was not as linear as what is indicated by the visualization above. The context analysis phase constituted an ongoing process throughout the duration of the research collaboration, with different encounters providing a variety of data, applicable in more than one of the following phases.

Departing from an exploration of the intended use context, data was collected and fed into the design, intervention, and evaluation phases respectively as well as the final generation of new insights. As a consequence of the methods applied for collection of field data (observation studies, in-situ interviews, and workshops), one intervention most often provided data for more than one of the following phases. For instance, data regarding the preconditions of the learners was fed into all three phases, however in different ways.

Each of the phases of the process were approached from a participatory mindset. The distinct methods applied in the individual phases of the process, as well as the transferral of insight from one phase to another, will be further explained and exemplified in the following chapter.

A NOTE ON PARTICIPATORY DESIGN

As mentioned in chapter 3, Kairos requires consideration of the appropriate time, manner and place for a persuasive initiative to be successful. Appropriate time and place may be identified by the designer, whereas appropriate manner is dependent on the user's perception of the situation. Thus, I argue that persuasive design calls for participatory design in order for all three dimensions to be acknowledged and considered.

Participatory Design constitutes an approach to design that has its origins in Europe and particularly in Scandinavia (Bødker, 1996). The most central perspective in Participatory Design is an unshakable commitment to ensuring that those who are to apply a given technology, are actively involved in its design. As such, Participatory Design principles and practices are driven by an ongoing effort to understand how collaborative design processes can facilitate and ensure that all participants – both users and designers – are equally acknowledged as experts in their own right (Simonsen & Robertson, 2012). I refer to this acknowledgement of different types of expertise, as engaging in the process with a *participatory mindset*.

According to Simonsen and Robertson, participatory design may be defined as:

“A process of investigating, understanding, reflecting upon, establishing, developing and supporting mutual learning between multiple participants in collective reflection-in-action. The participants typically undertake the two principal roles of users and designers where the designers strive to learn the realities of the user's situation while the users strive to articulate their desired aims and learn appropriate technological means to obtain them”

(Simonsen & Robertson, 2012)

As such, Participatory Design traditionally constitutes a type of dialectic collaboration, in which design experts and domain experts cooperate in generating mutual understandings of the context and of potential solutions. In my collaboration with the DDEIO, I noted that although a participatory mindset was prioritised, the practical application was in some ways challenged in the *Designs for Sustainability* domain.

Thilde Møller Larsen who represented the DDEIO was initially considered a domain expert. But while she has physical access to the majority of

Danish military establishments, her position with DDEIO along with her status as a civilian result in her having little or no actual knowledge about the daily practice amongst the potential end users. She is however one of the most informed experts on energy and waste management within the organization. As such, I found that her role did not classify as a domain expert in a traditional sense, but rather as a Subject Matter Expert (SME). Actual domain experts would be e.g. military officers and preferably educational officers. Consequently, the practical application of participatory design inspired reflections regarding a potential transition from a traditional dialectic understanding of the participants, towards a trialectic perspective in which a distinction is made between design experts, domain experts and subject matter experts, all equally acknowledged for their expertise.

The distinction between different domain experts and SMEs, was found important as it lead to reflections regarding the two different levels of participatory design, which was taking place in the DBR process. One level involved the design group and included the SME, and another more extended level was based on several interventions and activities with domain experts. Both types of experts were acknowledged equally, but their involvement in the design process differed as did the participatory design techniques applied in the collaboration. Moreover, the distinction gave reason to reflect upon the type of insights that the different experts were able to contribute with, leading me to the conclusion that the trialectic perspective was in fact necessary when designing for sustainability, as neither domain experts nor designers can be expected to be sufficiently informed about the challenges and possibilities related to the domain. I elaborate further on this point as I present my design process in the following chapter.

A NOTE ON DATA COLLECTION

While it might have been possible to base my understanding of the Danish Defence Command and the challenges faced by the DDEIO on information gathered by exploring the different reports and analyses provided for me. The complexity of the case along with my distinct consideration of the rhetorical notion of Kairos, lead me to apply a mixed methods approach (Creswell, 2014), with an emphasis on qualitative methods in my data collection process.

As mentioned, qualitative research methods involve both collecting data in the field and strongly considering the users throughout the process. However, the approach also calls for the researcher to function as key instrument, basing findings on own research rather than on observations

or questionnaires conducted by others (Creswell, 2014). Moreover, the approach also holds a strong demand for reflexivity as the researcher's role, personal background, culture and experiences potentially shape the interpretation of data, not only imposing biases in the study but also influencing its general direction (Creswell, 2014).

In spite of not having served in the military myself, I found myself being somewhat biased towards the context. From history lessons throughout my years in school, various Hollywood films about military activities and also every day news coverage of world conflicts involving Danish and international soldiers. My expectation was that the military context would enforce behaviour change simply by giving orders, but I soon learned from the DDEIO that while this may be the case for subjects regarded as a priority, the military employees of all ranks appear far more arbitrary towards low priority subject such as sustainability. As a result, I found myself approaching the case with strong opinions towards the context, yet with no actual knowledge of the everyday practice.

In the acknowledgement that my insufficient understanding of the context would influence not only my analysis and interpretation of the reports made available to me, but also my interpretation of the data collected through the design and test phases of my DBR inspired research process, the necessity of a qualitative research approach was further underlined.

The qualitative data collection process took place throughout all four phases of my overall DBR inspired research framework. Data was collected through a combination of field observations, semi-structured interviews, creative design workshops, and meetings with the project group. As such, my data collection process may be seen as inspired by ethnography, however with the distinction that my data collection process is constructed by a series of interventions, not by a longer period of observations and participation (Creswell, 2014).

Data was preserved as field notes, photographs, and workshop material produced by participants. Upon testing the persuasive learning design prototype, data was further supported by a short questionnaire for the participating conscripts as well as some video recording of the learners interacting with the design solution. It would have been beneficial to collect film and sound recordings throughout the entire process, however this was not an option. For security reasons, video and sound recordings on military establishments require a security clearance by the Danish Security and Intelligence Service (PET), which could not be obtained for this project.

The decision to primarily base my data collection on field notes and non-compromising photographs was further supported by some of my initial encounters with military employees. Through my collaboration with the DDEIO, I was to some degree classified directly under the Danish Ministry of Defence. However, being a civilian, my position was not weighed heavily amongst the army officers. Additionally, my position as a university researcher also appeared to provoke some level of hesitancy from other army employees. During one of my first visits to Aalborg Kaserne, I conducted a semi-structured interview with an officer who at the time held responsibilities as an army instructor. My initial setting for the interview was a calm conversation between him, Thilde Møller Larsen and myself at a meeting room table. However, in experience, the officer spent much time standing by a whiteboard, educating me about the chain of command, and concluded the lesson with the word” *Besides, there isn’t a professor in that university you come from, who is as capable at communicating as an officer in the Danish army*” (Appendix B)

As I subsequently discussed the experience with Thilde Møller Larsen, she brought to my attention that she and her colleagues often encountered what they referred to as *academic intimidation*. Which to them explained that although employees with a certain military rank may hold a significant educational degree within the organization, they also have an awareness that their educational degree is not given the same acknowledgement and regard outside the organization. Although I had not perceived the officer as being very intimidated, the interview did leave me with the impression that it had been important to him to assert himself both through his physical position besides the whiteboard and his closing remark.

Understanding that my presence in the context appeared to evoke some reluctance from the domain experts that I was seeking to collaborate with, I made the decision to primarily use my mobile phone for data collection. By doing so, I remained able to collect pictures, without disturbing the context further. My choice to collect data by using my mobile phone, was partly inspired by Fogg’s arguments regarding the persuasive potential of smartphones, in which he states that one of the reasons why mobile phones hold a particular persuasive potential is that we bring them everywhere and feel emotionally attached to them (Fogg, 2007). In the acknowledgement that mobile phones are already a natural part of almost any context, I found that having my own mobile phone present for meetings, interviews and workshops, would not strike anyone as unusual.

DATA MANAGEMENT

While the numerous visits to different military establishments, meetings with employees at the DDEIO and presentations of my work within the Danish Defence Command, all contribute to my understanding of the context as well as to the lens by which I approach my analysis of the collected data, some interventions distinguish themselves by distinctly providing insights regarding the design, implementation, and evaluation of persuasive learning designs. Amongst the interventions that I have found particularly relevant to the process are the following, which have also been included in the thesis appendix for further reference:

Source	Activity	Data type
Workshop I Appendix A	Facilitation of workshop. First encounter with larger group of military service representatives	Field notes, Photo documentation Presentation slides
Observations and in-situ interviews Appendix B	Semi structured interviews with army employees. Observations at Almegaard Kaserne Bornholm, notes from meetings with army conscript instructors	Field notes,
Workshop II Appendix C	Facilitation of workshop with participants from Danish Ministry of Defence, Danish army and Special forces, and DDEIO	Workshop notes Photo documentation
Prototype test Appendix D	Test of prototype at Almegaard Kaserne. Test was conducted with 80 army conscripts	Field notes Photo documentation Game data Video recordings

Creswell argues that the analysis of qualitative data most often goes hand in hand with other steps of the qualitative study (Creswell, 2014), and in relation to this particular project that was to a great extent the case. Much data – such as examples brought up in conversation with participants, was processed in the same situation. Through my field notes, I was enabled to refer new information to previous interviews or observations. Moreover, the data processing and analysis was initiated during the follow up conversations amongst the design group participants, held immediately after most interactions with domain experts.

In order to maintain an overview of the case and of the data I collected, I applied a data analysis process greatly inspired by Creswell's model for qualitative data analysis, although without applying the model

stringently. In spite of the linear appearance of the model, it is in practice a more iterative process, and the different stages were not initiated in the presented order. The data emerging from qualitative methods is descriptive, and focuses on the occurring process as well as on the outcome. In the interpretation of data, focus is directed towards particulars of a case rather than on generalization (Creswell, 2014). Consequently, my data analysis and processing may be visualized as following:

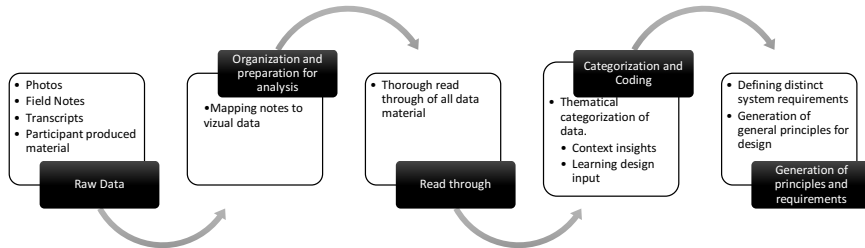


Figure 10 - Visualisation of data analysis process, inspired by Creswell 2014: 227

Upon each engagement with domain experts, my collected data in terms of pictures, sound recordings, short films, and field notes, were organized and a brief summary of my experience was added to my personal research portfolio. This way, I was able to support my recollection of the different encounters with a combination of field notes along with an initial interpretation of the data collected. I refer to this activity as part of my organization and preparation of data for further analysis. As the DBR process progressed into the design phase, the data collected at the time was thoroughly read through, and subsequently categorized and coded in accordance with its assessed contribution. Due to the nature of the data collection process, some encounters provided insights for more than one phase of the DBR process. Hence the coding of data focused on themes such as *Expressed values* and *Design requirements*, enabling me to consider not only the domain expert's view on the distinct design, but also their insights regarding the appropriate manner of implementation and evaluation. From the coded data, principles and requirements for the different phases of the DBR process were established. I elaborate on this in the following chapter.

Some activities of particular interest to the DDEIO group furthermore analysed and discussed in internal reports, and design group meetings of particular significance were summed up in minutes. The combination of

my own portfolio and the development of documentation provided for DDEIO, constitutes a meaning condensed account of my experiences in the field. As such it serves as reference for the design process, as well as a basis for my own research regarding the relationship between persuasion and learning, and the establishment of a methodology for persuasive design.

CHAPTER 5. PERSUASIVE LEARNING DESIGNS

Having explained in the previous chapter, my reasons for approaching my research from an explorative mixed methods approach, and presented the general elements of my research design, this fifth chapter aims to provide a more detailed overview of the different phases of the DBR process. By this, I seek to explicate how the different phases were bridged together, and to exemplify how different persuasive technology perspectives presented and discussed in Chapter 3 were considered in the design process.

The process is briefly described in the 5th paper included in this thesis. However, due to the focus of the paper, and the restriction of pages for a conference publication, the paper lacks rich descriptions of how the collected data and the results of the participatory design activities were fed into the design solutions.

The chapter is descriptive in nature, partly as a result of my predominantly qualitative approach, and partly as the initiatives taken within the different phases comprise the foundation of my investigation of the implications of applying my understanding of persuasive design in practice, as well as my exploration of the relation between persuasive design and learning. Hence, the extensive description of my process is aimed at facilitating my answering of the previously stated research questions.

- What defines persuasive design as an approach to behaviour design, which is applicable both in theory and in practice?
- What defines a persuasive learning design and in what ways do theories of learning and knowledge processing contribute to the definition of persuasive design?
- How can different perspectives of persuasive technology and persuasive design be applied in the development of persuasive learning designs?
- Is it possible to develop a methodological approach to persuasive design that bridges between system-oriented design features and user-centred perspectives?

The insights and experiences present in the individual phases, are further elaborated in the fourth and final phase of the process, in which I

conceptualize the initial steps towards a methodological framework for persuasive designs.

PHASE 1: IDENTIFYING PROBLEMS AND INNOVATION POTENTIAL

In accordance with the recommendations of the DBR Innovation Model, my approach to the first phase of the process, was not solely to identify the problems of the existing solution, but also to identify the innovation potential of the context (Christensen et al., 2012). In practice, my approach combined desk research and fieldwork, which was subsequently discussed with the design group participants, and collaboratively transformed into requirements to be considered during the design phase.

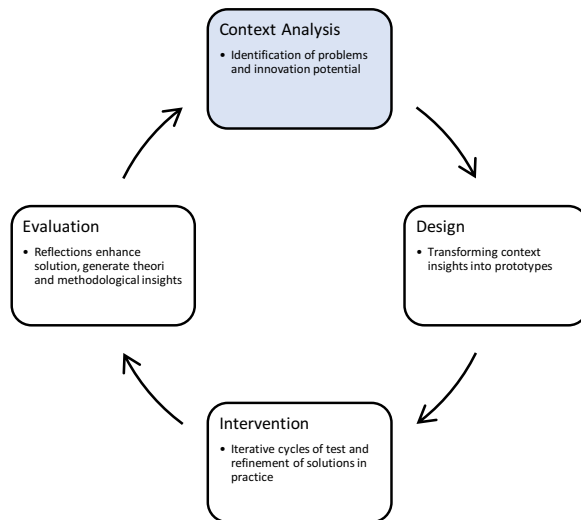
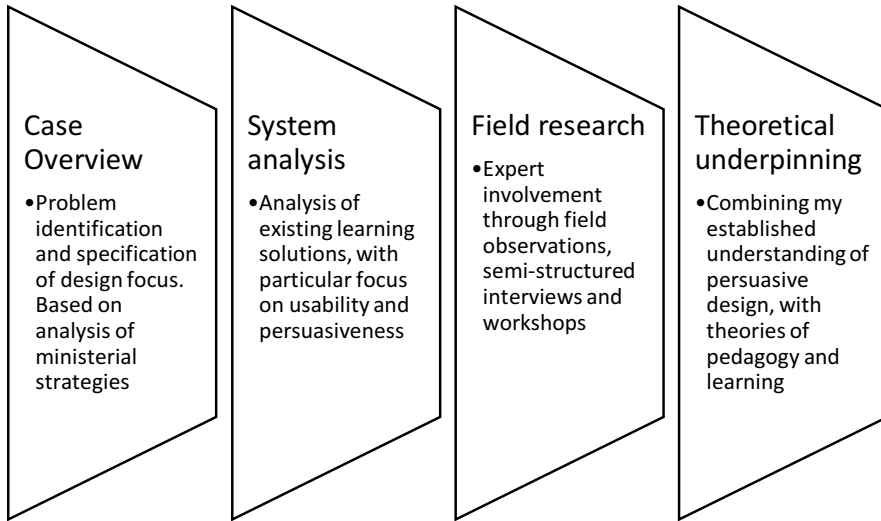


Figure 11 - Adaptation of DBR process, Phase 1

In my adaptation of the DBR framework, the initial phase also constitutes the most complex and extensive. Partly because the activities included in this step provides insights for all other phases of the process, and partly because it is in this phase that theoretical insights are combined with desk research and field observations into a combined framework for new persuasive learning design solutions. Hence, this first phase of the DBR process has included the following components:



In the following sections, each of these elements are presented with particular focus directed towards the insights which were subsequently transformed into principles and requirements to be considered in the design phase of the DBR process.

CASE OVERVIEW

As already mentioned, the Danish Defence Command is a highly complex organisation with high variety in work areas and very diverse employees. As a military command, regulations as well as strategic goals are determined by the Danish Ministry of Defence, under high influence of international affiliations such as the Danish membership of EU and membership of NATO. Having established a mutual interest in a further collaboration between the DDEIO and myself, Thilde Møller Larsen and I initiated the process by exploring areas and activities in which it would be relevant for me to participate. It was a shared priority that my efforts should be limited to areas, which were directly relevant for my research, but at the same time aimed towards specific challenges for the DDEIO. Consequently, my engagement with the DDEIO was specified further by evaluating the strategic goals for 2012-2015, set by the Danish Ministry of Defence.

Amongst the strategic goals which were found to be particularly relevant, were those included in the Ministry of Defence's strategy for environment, climate and energy (Ministry of Defence, 2012b) (Ministry of Defence,

2012a), along with the strategy for ICT (Ministry of Defence, 2011) and the strategy for competence development (Ministry of Defence, 2013).

From the climate oriented strategies, it was identified that the defence command – through the DDEIO were to:

- Decrease energy consumption by 20% compared to 2006
- Increase the use of energy from sustainable sources by 60%
- Reduce CO₂ waste by 40% compared to 1990

Moreover, it was a specific strategic goal that waste production should be minimized and that all employees in the defence command should receive education in appropriate waste management (Ministry of Defence, 2012b)

From the strategy for competence development, goals were set to not only optimize the time efficiency of all educational activities, but also to increase the use of digital learning so that up towards 50% of all courses within both the Danish Defence Command and the Home Guard would be offered as distance learning (Ministry of Defence, 2013). The digitalization goal was based partly on a need to standardise learning material, and partly out of practical and logistic needs. It had been identified that the complexity of an organization in the process of a general transition towards higher flexibility, imposed challenges to the existing educational structure.

In general, the military culture, not only in the Danish Defence Command, but also in most international militaries, is dominated by a strong hierarchical system, where orders are given by the highest ranking officers, and followed without further question by those of lower rank. As such, my immediate assumption was that a transition to more digitalised learning was predominantly a matter of system design, and that the green transition mostly called for appropriate orders being given by the right people.

However, a segmentation analysis conducted by *Operate* - an impartial strategy and communication company, identified that although the majority of defence command employees are open towards the notion of a green transition, far from all consider it a priority within the organization, and some are even opposed to the topic (Operate, 2012). Amongst the challenges stressed by the analysis, was the fact that the group of respondents who were reluctant to engage in a green transition, consisted solely of operative employees – and primarily employees with leadership responsibility. Quotes from the reluctant group of employees stated that they are already under an immense pressure as armed forces, and must focus their efforts on their principal assignment – to obtain and maintain

peace in areas of war. This calls for training and preparation for secondment, and in this perspective, climate issues are perceived as both irrelevant and superfluous.

In spite of the reluctance from some segments, it is a previously mentioned requirement both from EU and NATO, and subsequently from the Ministry of Defence, that climate issues are considered and communicated in the Danish Defence Command. While one segment was categorized as reluctant towards a green transition, others were positive but in need of more direct guidance towards an appropriate green behaviour.

Combined, the strategies and the segmentation analysis lead to the understanding that my immediate contribution should be the facilitation of a persuasive learning design for teaching appropriate waste management and motivating a positive attitude towards a green transition in the Danish Defence Command. Energy consumption was already being addressed through project *Green Army Barracks*, and from a persuasive design perspective, waste management represented a problem more related to user behaviour, whilst energy consumption to a large extent can be regulated through modern technology and smart buildings. Thus, with this distinct focus I would contribute directly to meeting the stipulated goals of the different strategies, while being able to conduct research in accordance with my own goals and interests.

SPECIFYING CASE FOCUS

It is a distinct feature of the Danish Defence Command that Danish men, when they turn 18 years old, are required to participate in a draw for drafting of conscripts for one of the military forces. Conscripts serve for a period of 4 months, thereby completing basic military training, and afterwards approximately 25% continue on with a military education. The majority of Danish conscripts are volunteers, however, the draft policy remains as a means to ensure diversity in the defence command, and to ensure that the cultural values of the Danish population is richly represented.

Amongst the initiatives already been made by the DDEIO, was an e-learning course on waste management, known as the Environmental Driver's License (EDL) (Forsvarsakademiet, 2014). Upon its release it had been intended that all employees in the Danish defence Command should complete the course and obtain a score of at least 80% correct answers in order to pass. However, in practice it was found that for several reasons the course was unsuited for several employee groups, including the conscripts.

Due to the drafting policy, conscripts are a highly diverse group of learners, where some may have struggled with basic reading and writing throughout their years in school, whilst others may be completing their 4 months serving, almost as a way to pass time before continuing on with e.g. a university education. The learning material presented in the EDL spanned from practical advice on day to day waste management, to complex examples of EU regulations regarding disaster management. As such, the learning material was not aimed at conscripts and the majority of the content was not only too complex but also irrelevant to their work. Moreover, the daily practice of conscripts does not involve spending time in front of computers – or any other ICT devices. Instead, time is spent on physical exercise, and basic military training, such as weapon's handling and maintenance and training in terrain. Consequently, a traditional e-learning course such as the EDL would require the military instructors to prioritise time away from the primary tasks of the conscripts, in order for them to go to an ICT facility and complete the course.

In collaboration with Thilde Møller Larsen, it was decided that I would contribute to a redesign of the EDL, focusing on developing a persuasive learning design for conscripts. By doing so, we would be able to consider both of the army establishments involved in Project Green Army bases, as both of these conduct basic military training. By focusing on conscripts, we were targeting a group of employees that do not have any particular responsibilities in the organization, and who we could quite easily be given access to. Moreover, the group was of particular interest to us, due to the argument that those who do not continue on with a military education, move on to become good members of society, thus enabling us to focus on designs which would not only influence practice within the Danish Defence Command, but potentially also the civil society.

Initial steps towards the redesign, had already been made, as Experience Design company *Bunker43* were employed to support the conceptual and technical development. The immediate recommendation from Bunker43, was to transform the EDL into a more game-oriented design.

My very first commitment with the DDEIO was brought about by challenges in the collaboration between DDEIO and *Det Nye Sort*, and my role in the workgroup was not only to ensure that any new version of the EDL would be both educative and persuasive for the conscripts, but also to facilitate the overall design process and the collaboration between DDEIO, Bunker43 and myself.

Consequently, a design group was established with Thilde Møller Larsen as subject matter expert representing the DDEIO and ensuring access to

domain experts and participants, Bunker43 as technical developers, and myself as persuasive designer and head of evaluation.

ANALYSIS OF EXISTING LEARNING SOLUTIONS

Having established the focus of my involvement with the DDEIO and the collaboration with Bunker43, an initial step for me was to analyse both the EDL and the first prototype of the new learning game, developed by Bunker43. This first prototype is hereafter referred to as B43.

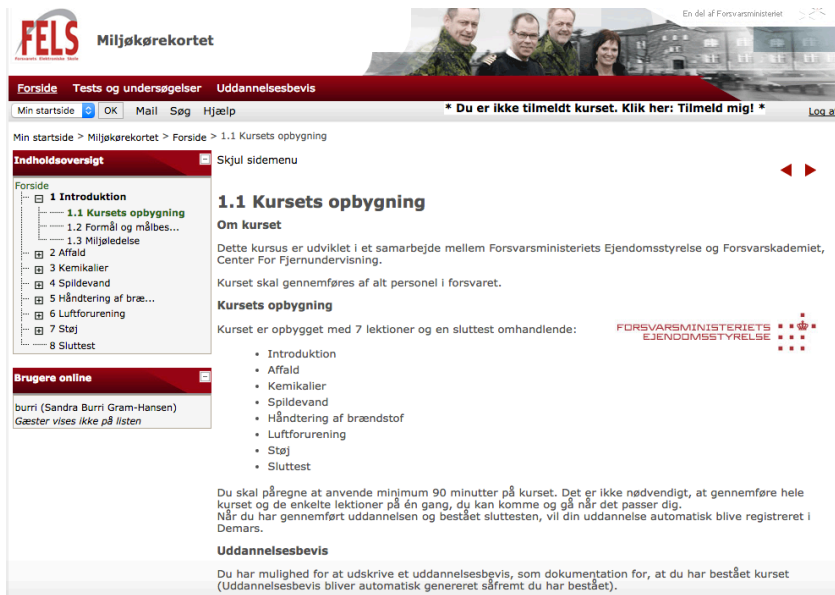


Figure 12 - Screenshot of the EDL introduction page

The EDL constitutes a traditional e-learning course where different subjects such as waste management (Affald), chemical management (Kemikalier) and waste water management (Spildevand) are introduced in short films, and followed by a multiple choice test. In order to pass the course, learners are required to score at least 80% correct answers. On average, it takes between 1,5 and 3 hours to complete the course. If the learner does not score 80% correct answers, the test must be re-taken.

An immediate finding of particular note were that the content is not tailored for any specific segment in the military. All users regardless of position and practice within the organization, were required to complete the entire course. Thus in order to meet the 80% benchmark for passing

the course, they would have to respond to information with no relevance to their practice within the organisation.

Unlike the EDL which is a web based learning application accessible via internet, the B43 prototype is a location based learning design which requires 4 large touch screens, 3 of which run the game and 1 administration screen. Screens are set up within the natural environment of the conscripts, preferably in a central location of the military establishment.

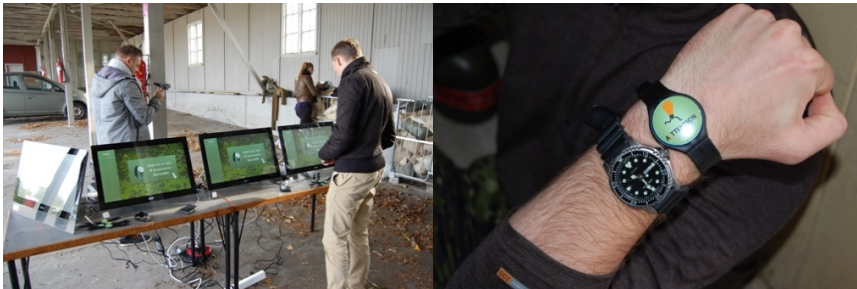


Figure 13 - Touch screen setup and chip bracelet for user interaction

The learning content of the system is identical to the material presented in the EDL, as questions and pictures had been extracted directly from the system. However, the B43 prototype did not include any examples or explanations.

The system analysis consisted of a heuristic analysis (Nielsen & Molich, 1990) of both systems, as well as a persuasive system design analysis. My aim with these analyses was partly to gain a better understanding of the existing systems and the approaches to learning which were taken at the time, as well as insights regarding which elements of the EDL had been transferred into the learning game. Moreover, I sought to initiate the dialogue within the design group about persuasive system design and persuasive design, so that we would be able to address which implications the persuasive design perspective would have for the design process, and as such I found it relevant to apply an evaluation method with a distinct focus on persuasive systems.

The inclusion of both a usability perspective and a persuasive systems design perspective in the evaluation of existing systems, was based upon my understanding of how the perspectives may complement each other. In the understanding that usability focuses on making it as easy as possible for the user to interact with the system, usability does constitute a key

factor in user motivation. For instance, the persuasive principle of reduction exemplifies how reducing complexity in a system can be a motivating factor in a behaviour change (Fogg, 2003). However, in reference of Miller, continuous attitude and behaviour change is a process and not something which is easily achieved (Miller, 2002). As a result, I found that while Nielsen's heuristics would provide me with a distinct focus on the user experience of the two systems, the PSD model would complement this analysis with a distinct focus on persuasive principles already applied.

HEURISTIC ANALYSIS OF EXISTING SYSTEMS, SUMMARY OF FINDINGS

Nielsen's heuristics are considered to be broad rules of thumb, or general principles for interaction design. The goal of the approach is to determine the usability of a system, by ensuring the transparency of the design, the correlation between the system and the intended context, and the minimization of cognitive effort by the user (Nielsen & Molich, 1990).

In the following, an overview of the results from analysing both the EDL and the B43 prototype is provided. For each heuristic, it is indicated if the principle was sufficiently considered (xx) present but not sufficiently considered (x) or not considered ()

Heuristic principle	Explanation	EDL	B43
Visibility of system status	The system should always keep users informed about what is going on, through appropriate feedback within reasonable time	X	
Match between real world and system	The system should speak the users' language, with words, phrases and concepts familiar to the user, rather than system-oriented terms.	X	X
User control and freedom	Users often choose system functions by mistake and will need a clearly marked "emergency exit" to leave the unwanted state without having to go through an extended dialogue.	X	
Consistency and standards	Users should not have to wonder whether different words, situations, or actions mean the same thing.		X

Error prevention	Even better than good error messages are a careful design which prevents a problem from occurring in the first place.	XX	XX
Recognition rather than recall	Minimize the user's memory load by making objects, actions, and options visible.	XX	XX
Flexibility and efficiency of use	Accelerators -- unseen by the novice user -- may often speed up the interaction for the expert user such that the system can cater to both inexperienced and experienced users.		
Aesthetics and minimalist design	Dialogues should not contain information which is irrelevant or rarely needed. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility.		X
Help users recognize diagnose and recover from errors	Error messages should be expressed in plain language (no codes), precisely indicate the problem, and constructively suggest a solution.	XX	XX
Help and documentation	Even though it is better if the system can be used without documentation, it may be necessary to provide help and documentation. Any such information should be easy to search, focused on the user's task, list concrete steps to be carried out, and not be too large	X	

The heuristic evaluation of the systems led me to be particularly attentive towards the lack of system status and user progress, the lack of flexibility, the complexity, and the lack of aesthetics in the design. While the B43 prototype did address some of the challenges of the EDL, such as applying a more consistent use of different terms, and minimizing repetitions, the system at the same time contains very little user support. The B43 design is minimalistic compared to the highly complex design of the EDL, however simplicity had been considered to an extent where it appeared to influence the user support.

PSD ANALYSIS OF EXISTING SYSTEMS

In spite of initially having been critical towards the Persuasive System Design Model by Oinas-Kukkonen and Harjumaa (H. Oinas-Kukkonen & Harjumaa, 2008), I found it to be the optimal choice for evaluating both systems. My critique is grounded in the model being based on Fogg's persuasive principles (Fogg, 2003) which as previously mentioned were not novel design principles, but based on Fogg's analysis of technologies which influenced users in the late 90's. Although acknowledging that the PSD model provides a more system-oriented formalization of the principles, I found that it would unlikely lead to novel designs. However, when applied as a method for evaluating systems it holds much potential, not only in terms of providing a system overview, but also with regards to establishing a language for discussing persuasive principles with non-experts.

Though the principles of the PSD model are based on the work of Fogg, there are also important differences. Firstly, the categorization of principles into different support types, facilitates a design focus on producing meaningful content for the user, rather than simply providing support or making a task easier to do. Secondly, the model provides concise descriptions of each design principle, along with exemplifications. By this, the PSD model comprises not only an applicable framework for analysing persuasive systems, it moreover provides a vocabulary for discussing persuasive technologies with non-experts.

When I choose not to apply the PSD model as a framework for my own design process, it is due to the following shortcomings:

- The system draws upon Fogg's functional triad, and does consequently not necessarily facilitate novel design ideas.
- Oinas-Kukkonen and Harjumaa addresses the weakness of the PSD model, being that it does not explain how the suggested design principles may be turned into system features (H. Oinas-Kukkonen & Harjumaa, 2009).
- In spite of including a contextual focus, and arguing that knowledge about the context is a requisite for design persuasive systems, the PSD model is solely system-oriented in its design focus.
- Surveillance and conditioning are discarded in the model, as Oinas-Kukkonen and Harjumaa deem them unacceptable means for persuasive systems. I disagree with the rejection of these principles, by reference to Albrechtslund, who argues that surveillance may in fact take many different forms and should as such not be deemed unethical in general (Albrechtslund, 2008)

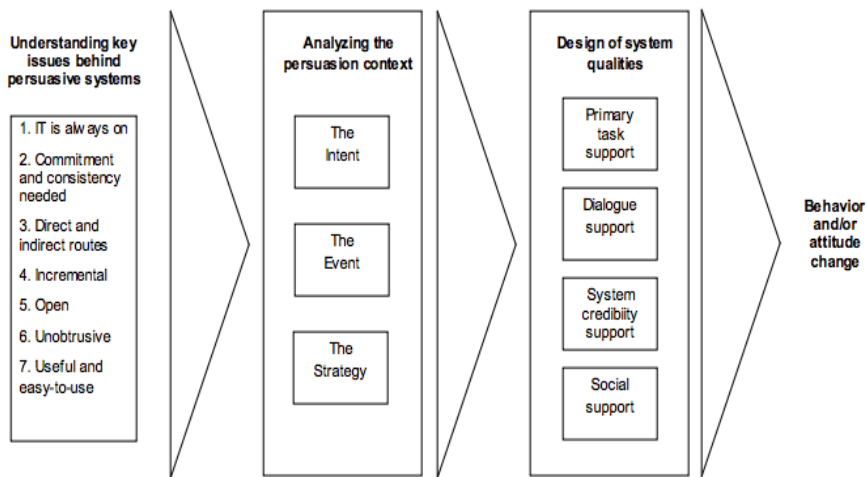


Figure 14 - Visualization of the PSD process (H. Oinas-Kukkonen & Harjumaa, 2009)

The process visualization in Figure 13, illustrates the overall categorization of the PSD model and the persuasive system design process. The persuasive principles have been categorized into the different types of system support contained in the *Design of system qualities* box, and as such, the primary focus is transferred from the principles themselves to the intent of applying the technology within the intended use context.

Within my own research, the PSD model was applied as a framework for analysing the system through a persuasive lens. However, rather than including the full range of persuasive principles suggested by Oinas-Kukkonen and Harjumaa, the analysis was limited to include the principles originally presented by Fogg as well as those principles found particularly relevant to the case. E.g. principles such as 3rd party endorsements and liking were excluded from the analysis.

In accordance with the process visualised in figure 13, the intent, the event and the strategy were identified, followed by an analysis of the application of persuasive principles within the system. In the following, an overview of the PSD analysis of the two systems is provided.

The intent: Equal for both systems were an intent to educate military employees on appropriate environmental behaviour, in order to motivate such behaviour on military establishments

The event: The use context is in both systems within the military organizational context. The EDL targets all military employees, while the B43 prototype targets conscripts in the army. The EDL is as mentioned a web based e-learning system accessible via traditional computers, while the B43 is run by 4 touch screens.

The strategy: The PSD model emphasises two elements to identify the strategy of a system, the message and the route. For the EDL, the message of the system was presented through short films and text followed by multiple choice quizzes. For B43, the short films had been removed and the message was conveyed through 11 multiple choice questions which had been found relevant for army conscripts.

Similar to the overview of the heuristic evaluation, the following table provides an overview of the identified persuasive features in the two systems. High support is indicated by (XX), Low support is indicated by (X) and No support is indicated by ()

Persuasive feature	EDL	B43
Reduction	X	XX
Tunnelling	X	
Tailoring		X
Personalization		
Self-monitoring	X	X
Simulation		X
Rehearsal	X	X
Praise		
Rewards		
Reminders	X	
Suggestion		
Trustworthiness	X	X
Real-world feel		X
Cooperation		X
Competition		X

Upon analysing the two systems, I identified that not only was the key issues of persuasive system design not considered in the design, nor was more distinct design principles such as tailoring, suggestion, or social feedback. Content was not tailored for the users, and no acknowledging feedback was supported through the system. B43 did apply reduction to both the system complexity and the content, however to an extent where it potentially influenced the learning potential of the system.

The usability of the B43 prototype may be regarded as high, and the content had been tailored to better fit the intended users. However, the lack of explanatory material in the system, potentially curtails the user from reflecting upon the actions. When presented with nothing more than an image and a multiple choice question, the user is given no basis to provide an informed answer, but rather a 33% chance of guessing right. Not only is this a questionable approach to facilitating learning, it is also in conflict with Miller's definition of persuasion as being a process which calls for the user to knowingly change attitude towards a subject, and subsequently change behaviour accordingly. Thus, in spite of being able to identify more persuasive features applied in B43 than in EDL, my conclusion was that the system did not support neither learning nor persuasion at the time.

INCLUDING THE VIEW OF THE EXPERTS

As stated in Chapter 4, my adaptation of the DBR methodology holds a distinct call for participatory design, in the sense that domain experts must not only be involved in all four phases of the process, they must also be acknowledged as experts equal to those of the designers. Participatory design traditionally distinguishes between designers and domain experts (Simonsen & Robertson, 2012), however when applying participatory design in the development of designs for sustainability, I found that a distinction between domain experts and subject matter experts is important, as it facilitates reflections regarding the expert insights provided – and also that which might be missing.

In the case at hand, the design group, as mentioned consisted of representatives from Bunker43, Thilde Møller Larsen and myself. In a traditional participatory design setting, Thilde Møller Larsen would represent a domain expert, whilst Bunker 43 and myself would categorize as designers. However, whilst Thilde Møller Larsen provides substantial expertise about the sustainability challenges of the military organization in a wider sense, she is as mentioned a civilian, and has no understanding of the daily practice of an army conscript.

Consequently, as I elaborate on the insights and contributions of the domain experts, I refer to two different levels of participant collaboration – one which took place within the design group and in which the group of participants remained unremitting, and one which was constituted by different yet significant encounters with army employees during my field observations and workshop activities. Mutual for both levels of collaboration was a distinct focus on establishing a mutual power balance between the participants, partly motivated by the fundamentals of

participatory design, and partly by the distinct claim for ethics in persuasion

In the subsequent sections, I refer to the following:

- **Collaboration with the design group**, which includes Subject Matter Expert Thilde Møller Larsen, Technical developers from Bunker43 and myself.
- **Collaboration with domain experts**, which refers to the encounters involving various domain experts, Thilde Møller Larsen, myself and most often Bunker43

As I discussed in Chapter 3, the notion of persuasion, and subsequently both persuasive technologies and persuasive designs, are argued to be a more ethical approach to behaviour change design (Miller, 2002). I have argued that when acknowledging the notion of Kairos as being key to persuasion, and when considering the notion of appropriateness, ethics is not only an important perspective to consider – it constitutes a defining element of persuasive design (S. Gram-Hansen & Gram-Hansen, 2013).

In persuasive design, as well as in HCI in general, ethics is most often taken into account in various evaluation processes. Traditionally, ethically evaluation of technologies is approached from a utilitarian perspective, thereby basing the evaluation on the consequences of implementing the system. Albrechtslund addressed this challenge by arguing that modern technologies tend to be applied in various unforeseen ways, and that designers consequently could not be held accountable for unanticipated consequences of implementing new systems or technologies (Albrechtslund, 2007).

“I suggest that any design theory must draw a clear line between intentions in design and the eventual use of technology. By clearly separating designer’s intentions and the con text of use, it is possible to acknowledge that these two contexts are in fact very different”

(Albrechtslund, 2007)

Although generally agreeing with Albrechtslund that traditional approaches to ethical evaluation may be problematic, I also find his argument regarding the separation of contexts challenging when considered in relation to persuasive technologies. When designing with the distinct intention to change user’s attitudes or behaviour, I find that the designer must be held accountable to some degree, and that the line to be drawn should more appropriately be placed between implementing a

persuasive technology in the intended use context or in other unforeseen contexts. This particular reflection not only relates directly to my understanding of persuasive design as being an approach which bridges between the persuasive technology and the intended use context, it also relates to the previously referenced arguments by Davis that VSD and Participatory design might hold particular potential in relation to persuasive design (Davis, 2009).

VSD is a theoretically grounded approach to technology design, which seeks to comprehensively account for human values throughout the design process (Friedman & Kahn, 2003). As such, close ties may be seen between VSD and Participatory design, where users are acknowledged as domain experts and actively involved in the design process – thus enabling their values to be taken into consideration through a distinct focus on participation and open dialogue.

In order to establish a more distinct ethical focus throughout the design process, I strived to include the so-called ontological ethical perspectives of Danish philosopher and theologian K. E. Løgstrup in all subsequent participatory activities.

The consideration of Løgstrup's argument that humans are ontologically entangled, and that ethics emerges through interaction, leads me to focus distinctively on establishing a context for interaction which would facilitate and promote the sovereign expressions of life. More specifically, for each encounter, my planning included reflections regarding:

- The relation between participants
- The location
- The activities

With a general focus on ensuring that all interactions with different participants were based on a mutual power balance, all three bullets were considered when planning an interaction. Reflections regarding the relation between participants is not novel within the participatory design field. It is generally understood that the role of the facilitator is to ensure that all participants are enabled to actively contribute and engage in the design process. Hence the facilitator plans and enables activities which are found appropriate in consideration of both the participants and the intended outcome of the participatory engagement. However, when also considering Løgstrup's ethical perspective, my focus extended from being directed towards the distinct situation, to also include more wide-spread considerations regarding the more general impact of the participatory design activities. It came to my attention that participatory design not only

facilitated a deeper understanding of appropriateness within the intended context, it also motivated a positive attitude change within the domain experts, and facilitated the transferral of knowledge and insights between the different phases of the DBR process. I exemplify and elaborate on this point in the following sections.

COLLABORATING WITH THE DESIGN GROUP

While the collaboration in the design group did not contribute directly to the requirement specification for the new design solution, the acknowledgement of the collaboration as a distinct level of participatory design is important none the less. Not only was the mutual language and shared understanding within the design group fundamental to the interpretation of the desk research and field research, but the collaboration moreover constitutes an important element in my reflections regarding the bridge between system-oriented design approaches and user-centred approaches, upon which I will be elaborating in a later section.

In order to facilitate the establishment of a mutual power balance, and to incorporate the mentioned reflections regarding location and activities, the location for meetings would rotate in order to ensure that the “upper-hand” would shift from time to time. Thus for our initial meeting we met at the office of Bunker43, where they presented their immediate version of the B43 prototype. For our second meeting we met at Aalborg University, where I presented my theoretically and analytically grounded thoughts on the persuasive and learning oriented potential of the system. At other times we would meet at one of the army establishments, whereby Thilde would be able to assume the role of the host in the group.

In accordance with Reeves (Reeves, 2006), my approach to the first meeting was unpretentious, as I sought to enable Bunker43 to present their suggestions and reasoning, without being challenged by my immediate reflections and first impressions. This was to some extent a diversion from Reeves’ suggested approach to DBR, where Bunker 43 would be considered design experts similar to myself. None the less, the humble approach to the work in the design group seemed relevant, not least in order to facilitate the establishment of trust and open communication within the group.

Prior to the second meeting in the design group, the previously mentioned heuristic evaluations and the PSD evaluation were conducted, enabling me to base my comments regarding the both the EDL and the B43 prototype on analytical results and theoretical reflections. Moreover, it

was at this second meeting that the initial steps towards establishing a mutual language within the design group were taken.

While applying the PSD model, I particularly noted that the first phase of the process visualised in figure 13, *Understanding key issues behind persuasive systems*, are presented in a common sense manner which both experts and non-experts can participate in reflecting upon and discussing. The phase presents key issues to persuasion and more specifically the following seven postulates:

1. Information technology is never neutral
2. People like their views about the world to be organized and consistent
3. Direct and indirect routes are key to persuasion
4. Persuasion is often incremental
5. Persuasion through persuasive systems should always be open
6. Persuasive systems should aim at unobtrusiveness
7. Persuasive systems should aim at being both useful and easy to use. (H. Oinas-Kukkonen & Harjumaa, 2009)

As I engaged in discussing the challenges and limitations of both the EDL and the initial version of the location based learning game with Bunker43 and Thilde Møller Larsen, I actively applied the PSD terminology in my explanations, and used the postulates as well as the different categories as springboards for reflections and discussions in the design group.

In the acknowledgement that the complexity of the PSD method demands substantial insight into the persuasive technology field, the application of PSD terminology was not distinctly explained to the design group. The aim was not to transform all participants of the design group into persuasive system design experts, but merely to facilitate communication about the potential persuasiveness of the design at hand. Hence, in practice the postulates of the PSD model were converted into more distinct questions which were then discussed by the design group in collaboration, and related to the insights gained from field visits.

In spite of my initial disinclination towards the PSD model, I found that while I remain critical towards its ability to lead to novel design proposals, it holds potential as a tool for facilitating communication during the design process. In my understanding, persuasive system design – similar to e.g. information architecture, can to some extent be considered an invisible layer in the design, as the persuasive potential is not based upon the distinct design principles, but on the manner in which they are applied. Non-experts are often able to identify and discuss e.g. the visual interface design or the usability of a system, but find it harder to identify, reflect

upon or discuss the more imperceptible layers of a design. Thus, communicating about the persuasiveness of a system, imposes a challenge for both experts and non-experts, and it is this challenge which the unconventional application of the PSD model allowed me to address to some extent.

COLLABORATING WITH DOMAIN EXPERTS

While the members of the design group remained constant, the collaboration with domain experts was more diverse. The complexity of the organization, along with the recognition that sustainability is not a main priority, precluded the option to have a domain expert permanently join the design group. Instead, the collaboration with domain experts was based on several encounters during my field research, out of which some contributed with distinct insights regarding the challenges related to environmental education at the time, as well as inspiration regarding innovation potential. In the following, I provide examples of my encounters with military staff, in order to refer to their contributions in the following phases of the DBR process. A richer description of each encounter is included in Appendix B.

When meeting with different army instructors or military personal in general, I would most often plan for it to take place at their premises. Not only for their convenience but also to provide them with home turf. Having experienced a tendency to react to my enquiries with reluctance, it was a priority for me to ensure that participants found themselves able to speak openly and express their opinions. Along with the mentioned security clearance issues, this was also part of my reasoning behind predominantly collecting my data by use of my mobile phone, and also my choice of semi structured interviews and in-situ interviews rather than structured interviews.

Semi-structured interviews at Aalborg Kaserne

The first significant encounter occurred during one of my visits to Aalborg Kaserne, where I conducted the previously referenced semi-structured interview of an education and training officer of the army, and subsequently a similar interview with a corporal from the military distribution and depot.

During our meeting, the officer explained that although it is acknowledged that the DDEIO is hierarchically positioned directly under the ministry of defence, the tendency in the army is to disregard all information which has not been sanctioned by a direct superior officer. He explained that this

was due to the heavy load of information constantly being disseminated into the organization, as well as to the lack of segmentation of the material. E.g. information regarding political strategies at EU level were automatically discarded as irrelevant, as instructional officers were not competent to transact business of that kind.

When distinctly asked about dissemination of environmental strategies and initiatives, the officer clarified that with the workload already being covered by his segment in the army, environmental issues were not prioritised. In general, the officer demonstrated a clear unwillingness to comply with any initiatives taken by the DDEIO. Moreover, the officer specified that the initiatives were seldom realistic in practice, and referred to a recommendation made by the DDEIO that employees should switch off their computers when the leave work, rather than leave them on standby.

It had been identified by the DDEIO, that a substantial number of office working military employees, do not switch off their computers when leaving work, neither during the week, nor when leaving work for longer periods of time, such as holidays or months of maternity/paternity leave. Not only is this a source to energy waste, which could be eliminated without it having any impact on the daily practice of the employees, it also imposes a security risk, as military computer systems are updated overnight, and computers which are never restarted, are not given security updates.

However, when presented with the information, the officer provided an often heard counter argument, that the military computers are too old, and as such take too long to start up if they have been completely shut down, and moreover, that several months' work was accidentally lost, when computers were shut down.

In contrast, the meeting with the officer was followed by a semi-structured interview with a corporal from the military distribution and depot. The physical distance between the officer's office and the corporal's repository was less than 100m, however, there was a distinct difference in the attitudes towards environmental behaviour in the army.

The corporal was noticeably pleased to be given the chance to demonstrate and explain the initiatives taken by himself and his colleagues at the repository. Computers were switched off every night, as the corporal explained that not only was the system updated over night, but so were the inventory lists – and the repository would not be able to provide the necessary equipment to all employees without the updates. Moreover, on

the initiative of the employees, a cardboard pressing machine had been installed in the repository. By this, waste management had been optimized in the repository as all waste was now sorted correctly. Concurrently, the pressing machine also evoked a time optimization for the employees, who no longer had to dispose of cardboard on a daily basis, but now only had to drive to the waste management transfer station once a week.

The two interviews not only stressed the contrast in attitudes towards energy and climate related initiatives in the army, which was also addressed in the previously referenced segmentation analysis (Operate, 2012). More interestingly however, in spite of the difference in opinion towards the subject, both the officer and the corporal described how the attitude towards any subject in the army was greatly influenced by the daily practice of the targeted users.

The relevance of considering the practice in relation to learning, was further emphasised as I facilitated a second workshop for the DDEIO. The workshop in question is described in more detail in Appendix C, and also in paper number 4 “*From Participatory Design and Ontological Ethics, Towards an Approach to Constructive Ethics*” (S. B. Gram-Hansen & T. Ryberg, 2015).

The particular workshop was not held with the aim to facilitate the development of persuasive learning designs, but was instead meant to facilitate Project Green Army Barracks (F.B.E., 2012) by defining the requirements of the users. Consequently, I do not provide a detailed account of the workshop in following, but simply refer to a conversation which was of particular relevance to my work.

Workshop participants included participants from the Ministry of Defence, the DDEIO, the brigadier general from Aalborg Kaserne, and high ranking educational officers from the army and the special forces, arriving from army establishments throughout the country

Contrary to my other encounters with army employees, I made the decision to move them off base and instead invite them to the ELL Design Lab at Aalborg University. By doing so, I ensured that all participants were moved out of their ordinary contexts and into a different and creative environment. The change of location was based on the same considerations regarding ethics emerging through interaction, thus, the location for this workshop was chosen to ensure that no-one would be able to dominate the workshop activities simply by knowing their way around the premises.



Figure 15 - Workshop discussions in ELL Design Lab

Project Green Army Barracks was partly constituted by an architect competition, where different architectural companies in Denmark were invited to present their suggestions for new sustainable military buildings. As previously mentioned, Aalborg Kaserne and Almegaard Kaserne had been chosen as pilot locations for the competition. The overall aim of the workshop was to generate directions for the architects, stating user requirements without suggesting any design solutions. Through various activities, the participants established a shared understanding of the primary challenges of the current military establishments. At the end of the workshop the participants worked in groups and applied play dough, crayons and Lego as they created prototypes of what the future Green Army Barracks should look like. The benefit of the final activity were the very rich explanations regarding the requirements of the future army barracks, which could subsequently be formalised into written requirements.

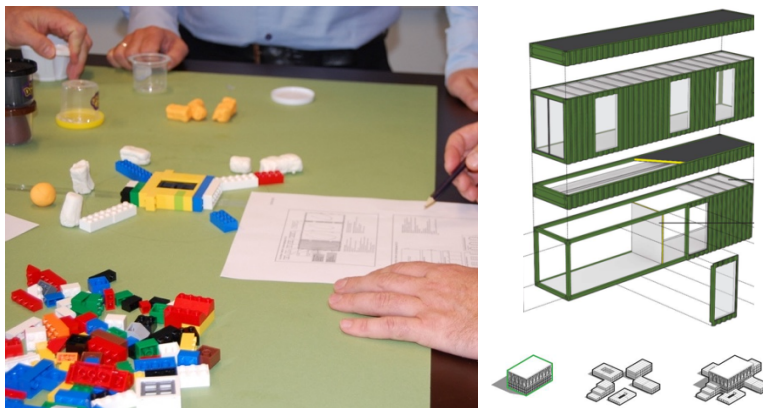


Figure 16 - Lego establishment transformed into future green army barrack

As visualized above, the requirements defined during the workshop were identifiable in the architects' drawings, and in the buildings currently being built as visualized. However, pleasing as it was to see the results of the workshop feed directly into the design proposal, the discussions during the workshop also provided me with valuable insights regarding the development of new learning designs.

On a general level, the workshop provided me with a far more nuanced understanding of the values and opinions of the army officers with regards to sustainability issues and environmental education. One of the participating army instructors addressed the fact that where basic military training used to be a 9-month duration, it has over recent years been cut down to 4 months, however without decreasing much learning material. Consequently, many military instructors find themselves challenged by the expectancy to include even more topics in an already tight schedule. With environmental issues not being considered a primary focus of military employees, the topic is most often given a low priority compared to other elements such as weapons education and physical training (S. B. Gram-Hansen, 2013).

I perceived the comments from the participant, not as a reluctance towards environmental education being part of the basic military training, but more a pragmatic reflection towards the subject in general. The challenge with much learning material to teach and too little time to so, is well known to other educational institutions. In this particular case however, it gave reason for distinct considerations both regarding the dimensions of Kairos and regarding the type of learning which we were to facilitate.

An important point was made by one of the participating officers, as he explained that they were very much aware that a less hierarchical structure could be beneficial from an educational perspective. However, he also argued that the chain of command and the non-negotiable authority of the officers in command was a necessity when soldiers were posted abroad, and that it could potentially be too difficult and consequently life endangering for the soldiers to shift from a less authoritative tone when in Denmark, into a very strict sense of authority when posted in areas of conflict. As such, he considered it vital to maintain the hierarchical structure also when in safety at a Danish based military establishment, and his respectful way of addressing the Brigadier general was not an indicator of inferiority in the specific situation, but an acknowledgement of the Brigadier General's rank within their practice.

Another argument was presented as one of the groups discussed which facilities were necessary on a future military base. The question was

raised whether it would become more attractive to conscripts to continue with a military education, if the establishments provided them with study apartments rather than the traditional barracks where 12 men share a room, sleep in bunk beds and only have a very narrow cupboard for storage of personal items. The idea to upgrade the living facilities for conscripts was quickly rejected by one of the participating officers, who explained that the current solution was in fact part of their education. He stressed that the sleeping quarters are not only used by conscripts, but also by the trained soldiers who are preparing to be stationed abroad. He then argued that if a soldier is not able to adapt to staying in a crowded sleeping quarter with no privacy and common showers, there is no chance that the soldier will be able to acclimatise to living in an even more crowded military trailer in a war zone.

Moreover, he explained that the living arrangements as well as most activities are designed in a way which requires the conscripts to collaborate in order to make their time in the army not only tolerable but also pleasant. He elaborated that Danish soldiers are generally well respected in international alliances, as they solve their tasks based on a strong sense of collaboration, not dictated by the commanding officers. This sense of collaboration is something that emerges during the Danish military education and over time becomes an integral part of the practice within the different segments. This distinct feature of the Danish soldiers was according to the officer credited to the Danish drafting policy, which ensured diversity amongst the conscripts, thus demanding them to find ways to collaborate from their first days in the army.

Although it was not directly articulated by the participants, the examples much underlined that the daily practice on base is very much considered part of the army education. While the subjects that are given a high priority such as weapons management and equipment maintenance are also emphasized through distinct lessons, the general concept of working in the army is equally taught by participating and engaging in the daily practice of one's segment.

The discussions during the workshop, and in particular the rich exemplifications of army education as being constituted by more than the planned lessons, served as a primary inspiration for including Wenger's communities of practice as part of the theoretical foundation of the new learning design.

THEORETICAL UNDERPINNING OF NEW DESIGN

While the desk research and field observations presented in the previous sections contributed with various insights regarding the challenges and potential in relation to persuasive learning design for army conscripts, this final section of the first phase of the DBR process aims to elaborate on the theoretical foundation of the new design. More specifically, the practical implications of applying the theoretical framework presented in chapter 3 in relation to well established theories of pedagogy and learning.

In chapter three, I argued towards a distinction between persuasive technologies and persuasive design, by considering persuasive design a wider concept, which focuses on establishing an appropriate balance between the intended use context and the persuasive initiative. Technologies designed with the intent to facilitate a change of attitude and behaviour within the intended use context are referred to as persuasive technologies. By this I acknowledge the original persuasive technology framework developed by Fogg (Fogg, 2003), as well as the research and further development presented in the persuasive technology conference series. However, I extend and conceptualize the notion of persuasive designs, by reference to the rhetorical notion of Kairos.

Although Kairos is generally understood to be three-dimensional, Kinneavy provides a thorough state of the art of historical and rhetorical references to Kairos, which points towards the understanding that Kairos originally consisted of only two components, namely the concepts of right time and appropriate measure (Kinneavy, 2002). However, a further exploration of the concept, leads to the understanding that although Kairos is most typically thought of as “timing” or “the right time”, its use goes far beyond temporal references (Sipiora, 2002).

Thus, Kairos calls for a combination of wider and more contextual reflections as well as narrow and more system-oriented considerations. It is on the basis of this peculiarity that I find it important to draw the mentioned distinction between persuasive design as a reference to the wider understanding of Kairos, and persuasive technology as the narrow and more system specific conceptualisation.

According to Sipiora, Kairos first appeared in the *Iliad* by Homer, where it refers to a vital part of the body – one which is particularly vulnerable to injury and in need of extra protection. Thereby, Kairos was also given a spatial dimension. To further highlight the contextual element of Kairos, I refer to the distinction between Kairos and Chronos. Chronos refers to linear time, whilst Kairos is considered the good or appropriate time for

an action to take place. In other words, Kairos is a point in time with certain significance derived from an intended goal (Sipiora, 2002).

When applied as basis of a persuasive design process, Kairos being a multispatial concept holds a primary focus on ensuring an appropriate balance between the persuasive technology and the intended use context. Thus, rather than focussing solely on the system development process, the technology must be designed in a way which accommodates the situation.

In practice, the wider notion of Kairos was considered through the previously described focus on participatory design. During this, the application of constructive ethics sought to facilitate that the mutual understandings acquired amongst the participants was also transferred into the succeeding phases of the design process. In contrast, the narrow and more system-oriented perspective of Kairos and particularly the dimensions of time and place, were directly considered in the design process, as the persuasive learning design focused on facilitating learning at the right time and place within the intended context. A bridge between the wider and narrow perspectives of Kairos was established through the focus on appropriate manner, which was informed by the participatory design activities and subsequently transformed into distinct design solutions.

PERSUASION, LEARNING AND COMMUNITIES OF PRACTICE

As referenced in chapter 3, Miller argues that *change* is based on a process, and that the ethical demand of persuasion calls for the persuadee to knowingly engage in the process (Miller, 2002). This distinct understanding of persuasion, to me signifies one of the notable overlaps between persuasion and learning, as both persuasion and learning may as such be considered a process in which the user actively engages. However, in spite of the overlaps, persuasion and learning may be distinguished from one another e.g. through the intentions of both the designer and the learner.

A distinct feature of persuasion, remains the designer's intent to change the attitude and/or behaviour of the user, in an ethically sound and transparent manner (Fogg, 2003; Miller, 2002; Spahn, 2011). While learning may be designed with the intent to change the learner's attitude towards a subject, this is not necessarily the case. Nor is the success of a learning design defined by a change in the learner. It may be that the successful outcome of a learning design is to simply provide the learner with knowledge and insight regarding a topic. Moreover, the distinction between persuasion and manipulation may be based on an endogenous

intent of the user to engage in changing process – a self-driven willingness of such. Learners, in contrast, may not be driven by the same inner motivation, but may engage in the learning simply as it is part of the curriculum, or out of a sense of authority towards the teacher and the educational institution.

Theories on learning are vast, however to elaborate on the concept, I find it particularly interesting to refer to Piaget's concepts of assimilation and accommodation, as these have to do directly with the processing of knowledge. The relevance of considering Piaget becomes even more accentuated by his approach to learning as being constructivist, thus excluding any forms of waterfall approaches to learning, where knowledge is simply transferred from the teacher to the student. In contrast, learning is constructed through interaction with the learning material and with the surrounding world (Illeris, 2007). As such, the constructivist approach to learning shares a fundamental commonality not only with Miller's understanding of persuasion as a process (Miller, 2002), but also with Fogg's claim that computer mediated persuasion occurs during the interaction between the computer and the user (Fogg, 2003).

According to Illeris, Piaget's theory of learning may be considered centred on the process of equilibration, by which the learning individual strives to maintain a balanced perception of the surrounding worlds, through continuously adapting to the surroundings and making the surroundings adapt to the needs of the individual (Illeris, 2007). This adaptation process is suggested to take place by continuously adjusting the cognitive schemas of the individual, referred to as the assimilative and accommodative processes. Assimilation refers to including new input in already existing schemas, while accommodation refers to adapting new input which does not comply with any existing schemas. Out of the two, assimilation is considered the easiest way of learning, where accumulative learning requires a higher cognitive effort by the learner (Piaget, 1999).

Although developed in relation to behaviour design, the relationship between ability and motivation may be considered by reference to Fogg's behaviour model:

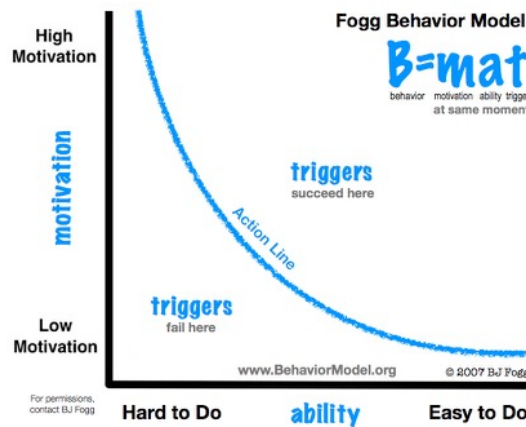


Figure 17 - Fogg's behaviour model

According to Fogg's behaviour model, difficult tasks, such as processing complex knowledge, requires a high level of motivation. When complexity is high and motivation is low, behaviour change, or in this case knowledge processing, is likely to fail (Fogg, 2009a). While the model may lead to the understanding that a primary feature of persuasive design is to increase ability by making things easier to do, Piaget's concepts of assimilation and accommodation provide an important gradation to this approach. Processing of knowledge which does not fit into existing schemas require more cognitive effort and are as such not easy. Nor is breaking habits in order to establish a continuous change in behaviour.

Consequently, I argue that learning holds much potential in relation to persuasive design, however not as a comparable approach to behaviour design but as a theoretical foundation for the persuasion process.

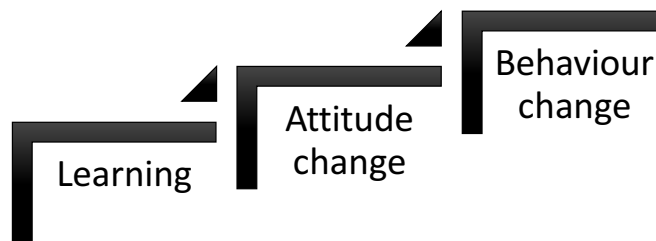


Figure 18 - Steps towards continuous behaviour change (S. Gram-Hansen & T. Ryberg, 2015)

In order for a person to change attitude towards a given subject, he or she must obtain and process new information. Either by experience, by knowledge being provided, or preferably by a combination of the two. Thus I argue that as theories of learning, such as Piaget's constructivist approach, provide insights regarding this process, learning may be seen as a fundamental step towards continuous behaviour change. Once having processed new input, the user may change attitude towards a subject, and subsequently become endogenously motivated to change behaviour (S. Gram-Hansen & T. Ryberg, 2015). Considerations regarding the relation between persuasion and learning are further discussed in paper number 4, *Attention – Influencing Communities of Practice with persuasive Learning Design*.

CONSIDERING COMMUNITIES OF PRACTICE

As mentioned in relation to my collaboration with domain experts, several participants indicated that learning in the army is by no means limited to the activities which take place during organized activities such as exercises in terrain or training on the shooting range. Contrarily, the participants explained and exemplified that the army distinctly considers engaging in the daily practice on the army establishments equally important to both the schooling of new soldiers and to the training and preparation of already educated military employees. Consequently, the collaboration with domain experts inspired me to extend my understanding of learning, to also include Wenger's communities of practice (Wenger, 1998)

Wenger introduces *Communities of Practice* as a social theory of learning, characterizing social participation as a learning process. Through engagement in different group constellations we interact with others and with the surrounding world. Over time these interactions lead to a mutual understanding of both the social interactions and the context, and as such learning takes place collectively (Wenger, 1998).

Communities of practice are associated through three dimensions: mutual engagement, joint enterprise, and shared repertoire (Wenger, 1998). By this, it is understood that all participants actively contribute to the community. The community of practice is not established solely by people becoming members of a group, rather it is established by a mutual interest and engagement by all participants. Moreover, Wenger states that there is a profound connection between identity and practice. Establishing a community of practice requires negotiation amongst the community members, in order for all participants to find an individual identity as part of the group.

From this, I argue that while army conscripts do not automatically become part of a community of practice, they may over time establish a collective approach to practice, such as described by Wenger. Moreover, the army may be understood more broadly as a community of practice in terms of the recognizable patterns, which exist within the organizational context. Some of the patterns are based on the hierarchical structure of the military, while others are based on the mutual engagement of the army employees. As newcomers to the community of practice, new conscripts must actively engage in the community in order to understand these patterns.

In relation to the development of persuasive learning designs for army conscripts, I found the notion of communities of practice particularly interesting, partly due to the established reluctance towards environmental education, and partly due to having established that the daily practice was already acknowledged as part of the education. From this, I found that a particular aim of the persuasive learning design, should not alone be to educate conscripts about appropriate environmental behaviour on base, but rather to influence their emerging community of practice, by motivating a more positive attitude and tone towards the subject.

IN SUMMARY

In this first phase of the DBR process, I have explained and exemplified the combination of desk research and field studies, which comprises the foundation of my understanding of the challenges and innovation potential in relation to persuasive learning designs for conscripts in the Danish army.

Moreover, I have extended the theoretical underpinning of the design process from my previously presented perception of persuasive design, to also consider Piaget's theories of assimilation and accommodation but also Wenger's notion of communities of practice. The practical implications of combining these different theoretical perspectives is further elaborated upon in the following sections.

As described in Chapter 3, the processing, analysing and coding of data was conducted with a distinct focus on identifying values and requirements to be considered in the design and implementation process. Progressing from a general overview of the data, different insights were categorized in accordance with the DBR phases they were identified to contribute to, and coding focused particularly on establishing values and requirements to be considered in the different phases. From this process,

I generated a number of principles and requirements to be considered in the design process.

The generation of principles are inspired by Creswell's description of the final step in analysing and interpreting qualitative data (Creswell, 2014). Creswell suggests that findings of the analysis may correspond to answering the question "What were the lessons learned?". In the case of my research, the analysis of data sought to explore what would be considered appropriate within the context, both in consideration of the values of the domain experts, but also in consideration of explicit needs and requirements for the education of army conscripts. Hence, the answer to my enquiries are comprised into the mentioned list of principles and requirements. These are presented and exemplified in the following sections.

PHASE 2: PERSUASIVE DESIGNS FOR LEARNING

Having explored different aspects of the intended use context, identified problems and innovation potential, the natural progression of the DBR process is to transfer the knowledge acquired in the first step, into working design prototypes.

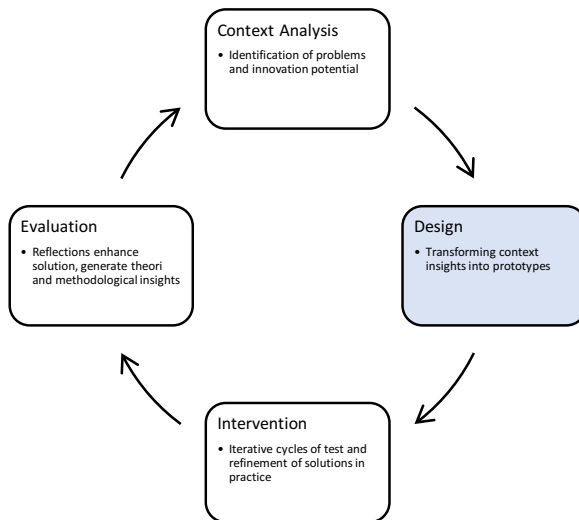


Figure 19 - Adaptation of DBR process, Phase 2

As previously described, a fundamental component of the DBR methodology, is the continuous collaboration between researchers and practitioners throughout the different phases of the process (Reeves,

2006). However, similar to the first phase, the second phase encompassed participatory design in two different levels. Domain experts were intermittently involved in the process of validating the identified problems and generation of ideas for new design solutions, whilst the SME representative participated more continuously throughout the process. While the unbalanced involvement of the different experts could be perceived as problematic, I found it to be justifiable not only in consideration of amount of time and work hours it would require for more experts to be involved, but even more so in consideration of the persuasive design perspective.

As presented in Chapter 3, the intent to change another person's attitude and/or behaviour is a defining element of persuasion, and does as such imply that the intent of the persuader is to influence the persuadee. Consequently, it may be argued that a paradox emerges from applying participatory design in persuasive design, as the relationship between persuader and persuadee is never equal and balanced.

Miller and Atkinson have argued that persuasion can be considered a more ethical approach to such influence (Atkinson, 2006; Miller, 2002), and I have argued that participatory design holds the potential to ensure that persuasive initiatives are designed in a manner which from a user perspective may be considered appropriate for the context. However, in consideration of the noted paradox between persuasion and participation, I argue that the distinction between domain experts and SME's supports designers in consistently and equally involving different experts, while still recognizing that the balance between the experts may be uneven.

As the goal of the persuasive learning design for conscripts, was to mediate the persuasive intent of the DDEIO, I found it justifiable that the collaboration with the SME was predominant during the design phase. However, to ensure that the perspectives and values of the domain experts remained a consideration throughout the process, they were frequently involved.

TRANSFERRING INNOVATION POTENTIAL INTO DESIGN PRINCIPLES

“When you make a thing, a thing that is new, it is so complicated making it that it is bound to be ugly. But those that make it after you, they don't have to worry about making it. And they can make it pretty, and so everyone can like it when the others make it after you”

Picasso (Papanek, 1985)

As presented in the case overview and specification of case focus, the goal of my contribution was not to produce an innovative learning design solution for environmental education in the army, but to redesign and further develop the EDL. As such, by reference to Picasso, my task was not to make something new but ugly, but rather to take something ugly and make it pretty, in order for the users to find it more appropriate, applicable and likable. Picasso most likely did not have classical rhetoric in mind when he was quoted. However, I find that the rhetorical understanding of beauty in relation to speaking provided a suitable springboard for the focus of the design process. Thus in accordance with Lindhardt, beauty was understood as not only visually pleasing, but also truthful, effective and appropriately fitted to the occasion (Lindhardt, 2003).

Based on the analysis of the existing learning technologies (EDL and B43), it was decided to maintain B43 as a benchmark for further development. The decision was based on the understanding that the prototype was already to some extent targeted towards the conscripts, although recognising that the tailoring of the system had not been done sufficiently. Moreover, the prototype shared some commonalities with the location based learning design described in Chapter 2, and thus the experiences and insights gained from the PLOT trial, could be considered and developed further in this design process.

In order to sustain the insights gathered during the first phase of the DBR process, and transfer these into the design, the initial step of the design process was to convey the data presented in the different sections of the previous phase into principles for the persuasive learning design.

The origin of the principles and requirements have been presented in the different sections of the first phase. The list presented in the table below constitutes a summarized and condensed overview of the extensive amounts of input. As it appears, the principles and requirements are listed in relation to the source from which they have been derived – corresponding to the different sections described in the first phase of the DBR process. In accordance with the participatory mindset applied during the data collection, all contributions are valued equally and the table does as such not indicate a prioritization.

The final column of the table briefly describes the actions taken to accommodate each requirement. These solutions are further explained and exemplified in the following paragraphs.

Source	Principles and requirements	Action taken
--------	-----------------------------	--------------

Ministry of defence: Strategies for digital learning and environmental education	<ul style="list-style-type: none"> • Solution must increase efficiency – both administratively and operationally • Solution must be cost effective • Solution must meet security standards • Solution must be applicable in all different army establishments • Content must be specified to fit the individual segments of the military • All military employee's must be educated in appropriate waste management 	<ul style="list-style-type: none"> • Proposed solution was time optimized compared to EDL, and designed to be applied as part of physical training session. • Solution is applicable at any location • Content is targeted the individual segments and may be easily updated or altered.
Analysis of existing technologies	<ul style="list-style-type: none"> • Solution must enable self-monitoring/process overview • Content must be relevant and language must comply with the context • Solution should enable some level of personalization • Solution should offer user feedback in terms of praise and rewards 	<ul style="list-style-type: none"> • Self-monitoring is available for individuals and groups on designated touch screen, and collective results are available for comparability on administration screen • Personalization is enabled by personal identification of conscripts • System provides feedback through colours and text and praise through points
Collaboration with domain experts	<ul style="list-style-type: none"> • Content must be relevant • Content should be relatable to real world practice • Solution should include collaboration • Solution may benefit from competition 	<ul style="list-style-type: none"> • Content is targeted conscripts and related to practice both on and beyond military base • Collaboration is established through group work • Competition is established both at group and individual levels

Theoretical underpinning	<ul style="list-style-type: none"> • Solution should encompass all three dimensions of Kairos • Intent/intended learning outcome should be made clear to the users • Solution must be informative • Solution must motivate reflection and discussion in order for conscripts to construct a mutual understanding of the subject 	<ul style="list-style-type: none"> • Kairos is considered both as a wider situative concept and distinctly in the design (timing, location and appropriate manner of communication) • Instruction video is developed to provide fundamental information • Group work and scenarios are designed to motivate discussion and reflection
---------------------------------	---	--

In spite of being referred to as requirements, the list was not considered a stringent overview of necessities, but more guiding overview of the different perspectives which needed to be considered in the design solution.

While the technical development was carried out by Bunker43, the conceptualization was done in collaboration with all members of the design group. The design process was iterative in the sense that solutions would be discussed during meetings, developed by Bunker43, and then evaluated by the design group. In practice, this collaborative design process often ranged from simple sketched outlines on post-it notes and paper, to more distinct specifications which were then further interpreted by the technical experts from Bunker43. The result of the process was the functioning persuasive learning design prototype referred to as Attention.

ATTENTION

Some elements of the Attention prototype are presented and discussed in paper number 4 and 5 included in this thesis. Thus this section of the thesis will not go deeply into discussing the solution, but rather elaborate on how the different requirements were considered in the design. Attention constitutes a further development of B43, into a location and situation based learning game, targeted specifically towards the daily practice of the army conscripts.

Attention was installed locally on 4 large touch screens (1 administration screen and 4 group screens). Conscripts interact with the screens by a combination of touch and individual chip bracelets. The chip bracelets

ensured individual identification of all conscripts – thus enabling their results to be registered, while the size of the touch screen enabled conscripts to view material in groups and collaborate on responding to the content.



Figure 20 - Conscripts interact with Attention through a combination of touch screens and individual chip bracelets.

The touch screen setup and the different means of interaction was maintained in Attention, however the design was extended from being solely driven by the touch screens, to a broader inclusion of the intended context.

Based on the learning content of the EDL, 11 scenarios were described, each representing a situation in which conscripts would have to take appropriate action with regards to waste management. Scenarios included environmental subjects such as clean water preservation, fuel management, and chemical waste management, and spanned from preventive measures to disaster management. For each scenario, the conscripts were presented with three solutions, out of which one would be the appropriate response.

In order to ensure that conscripts could respond to the scenarios on an informed basis, an 11-minute instruction film was produced. The content of the film was based on the information of the EDL, but condensed to only include information directly relevant for the conscripts. Moreover, in consideration that only 25% of conscripts continue on with a military education, particular emphasis was placed on providing examples of appropriate behaviour which was relevant not only within the army context but also out in society. E.g. the film explained that whenever a jerry can is used to fuel a combat vehicle, a spill tray should be placed on

the ground to ensure that no fuel drips on the ground. The same principle is recommended when fuelling a normal garden lawn mower.

The instruction film was developed partly to ensure that the persuasive learning design was also informative, and partly in consideration of the previously described reflections regarding Piaget's concepts of assimilation and accommodation. In the acknowledgement that the waste management topic might be perceived as an irrelevant digression, the instruction film was designed with the intent to immediately motivate the conscripts to reflect logically about the different scenarios. The goal of the design was to provide the conscripts with confidence rather than to present waste management as complex and demanding.

As identified in the first phase and described in Appendix B, the conscripts are a highly diverse group, where some learn easily and others potentially struggle with learning disabilities or dyslexia. In order to take the diversity of the group into account, the instruction film provided explanations through both text and speech. Rather than redesign the touch screens to enable the introduction film to be displayed there, it was decided that the film should be shown under more traditional settings, in the establishment auditorium. As the army is considered a particular type of educational education, all military establishments have auditoriums or similar lecture rooms, with projectors and sound systems. Moreover, by introducing the film as well as the subsequent activities, in a more structured learning setting – and preferably having the introduction done by the conscripts' commanding officer, the importance of the subject would according to the instruction and education officer previously referenced (Appendix B) be deemed more credible.

Consequently, the Attention learning design would consist of two phases. A 15-minute instruction phase which would take place in the auditorium and primarily consist of watching the instruction film, followed by approximately 45 minutes of location based learning. – A notable time optimization compared to the 1,5-3-hour duration of completing the EDL.

Once having viewed the instruction film, the conscripts would be directed to the location of the touch screens. As mentioned in the list of requirements and design principles, the digital learning solutions must be applicable on all military establishments. Although the activities of basic military training for conscripts are generally the same, the army establishments are highly diverse, such as exemplified by the two army establishments included in Project Green Army Barracks. Consequently, in order to meet the requirement of application across different military

establishments, the screens were not designated to a specific location, but simply required to be set up at a central location.

In order to facilitate the requirement for collaboration and competition, the game aspect of Attention was designed as a group activity, where groups of 4-5 conscripts would compete against each other. Each group would be assigned to one of the 3 game touch screens, and each individual group member would be required to register on the screen by use of the individual chip bracelets. Groups were required to register with their army nickname, and include their ID number, so that their individual results could be registered.

As previously described, the game element of Attention consisted of 11 scenarios which the conscripts would all have to respond to individually. To relate the scenario to the physical location in which it might realistically take place, conscripts would instantly respond, and then be provided with information about a location and 3-digit colour code which they would then have to retrieve. Points in the game were rewarded through a combination of correct answers, retrieval of correct colour codes and hastiness.



Figure 21 - Colour code located in the Weichel washing area, and admin screen score board

Through the collaboration with domain experts, and particularly the conversations with officers with educational responsibilities, it was made clear that environmental education was often deprioritised due to an extensive curriculum for basic military training having to be covered in a very short duration of time.

Amongst the activities which were indicated as a high priority not only for conscripts but also as an important feature of the future green army barracks was physical training (Appendix C). By including hastiness as one of the basis of scoring points in the game, the design sought to further incorporate competition in the design, and more importantly to develop a solution which would be more easily integrated into the daily practice of the conscripts. As the game required conscripts to complete several intervals of running, the environmental education could be covered as part of a physical training session. Thus, the time optimization aspect of the design was emphasised even further, and moreover, the notion of context adaptation was brought into consideration in practice. As mentioned in Chapter 3, as well as in paper number 1, persuasive design should be as unobtrusive as possible (S. B. Gram-Hansen & Ryberg, 2013; H. Oinas-Kukkonen & Harjumaa, 2009) Initiatives should be designed in a manner which is not only appropriate to the context by not being offensive or invasive, but in a way which feeds into the practice of the context, and enables the context to be part of the persuasive mediation.

Contrary to traditional computer games, location-based games are understood as games where the users interact with the game by changing their position and visiting different locations. As such, the digital media becomes secondary to the game, as players meet in the real world and interact with each other within the game context. In order to accommodate the mobility of the user, location-based games are traditionally played by use of mobile computing devices such as mobile phones or GPS trackers (Nicklas, Pfisterer, & Mitschang, 2001). Location based games may be divided into three different categories; *Mobile games*, in which the game only occurs when two players meet, *Location aware games* where game events happen when a user visits a certain location, or *Spatially aware games* which integrates real world surroundings into the game, and where game events occur when the player enters a certain spatial context (Nicklas et al., 2001).

Even though locations are taken into consideration in Attention, the game aspect of the design distinguishes itself from the general understanding of location-based games, by the dismissal of mobile devices and by the lack of activity on the designated locations. The chip bracelets do not track the user's whereabouts, and all interaction between the conscripts and the game is facilitated by the touch screens.

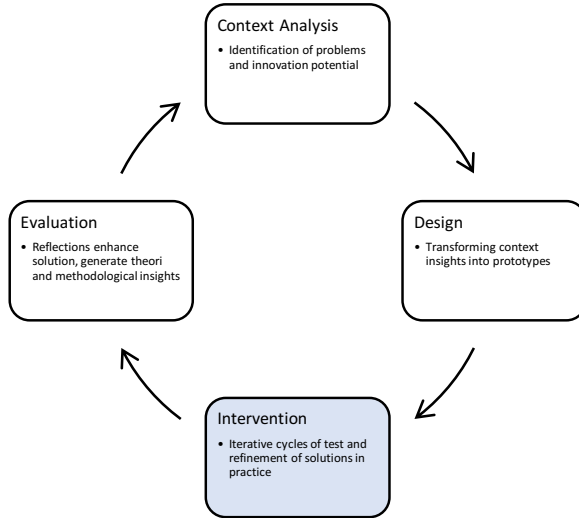
This was a distinct design choice made to ensure that the design would be applicable on all military establishments, and thereby meet the requirements identified in both the ministerial strategies and through collaboration with domain experts. The colour codes are easily moved from

one establishment to another, and the designated locations can be changed if needed. Thus, if the vehicle washing area on some military establishments is located too far away from the touch screens to be included in the game, the conscripts can instead be directed to the weapons cleaning area in which the same principles for appropriate behaviour will apply. Besides from the practical benefits of applying colour codes to mark the locations, this distinct design choice was moreover based on reflections regarding Kairos as a wider and more situative concept, as well as distinct considerations regarding the persuasive features of simulation. From the theoretical framework presented in Chapter 3, it was argued that this required consideration of all three dimensions of Kairos, not only in the methodological framework, but also in the practical design.

The intent of the design is to educate the conscripts in appropriate waste management, and to influence their attitude towards the subject in a positive direction – to change both the attitude and the behaviour of the users. When reflecting upon situations where the conscripts would actually apply the knowledge achieved through Attention, it was noted that a common feature for both preventing accidents and managing disasters is the type of situation in which the knowledge is actualised. Accidents involving fuel, chemicals or waste, seldom happen when people are focused on what they are doing. Accidents occur during stressed situation where many things must be considered at the same time. E.g. when conscripts have returned from training in terrain, they are tired and busy cleaning up their equipment and not necessarily attentive towards the bucket of oil and waste water left on the ground. With the element of hastiness, in combination with the need to remember 3-digit colour codes, the learning design strives to simulate situations where the soldiers are under pressure to do several things at the same time, and still be able to recall the correct way to manage a given scenario. Furthermore, the focus on simulation also emphasised the collaboration element of the game, as conscripts are never left by themselves to handle situations such as those presented in the scenarios. They will most often work in groups or at least in pairs.

In consideration of all the above mentioned reflections, and in the acknowledgement that Attention does not as such classify as a location-based learning game, it is hence forth referred to as a situation and location-based learning design.

PHASE 3: TEST AND REFINEMENT OF DESIGN SOLUTION



Figur 22 - Adaptation of DBR process, Phase 3

Having reached an operational prototype of the persuasive learning design Attention, the design phase was naturally succeeded by iterative cycles of testing and refining the design. Testing with conscripts took place at Almegaard Kaserne on Bornholm in November 2013 (Appendix D). As previously mentioned, the distinct focus on testing design solutions within the intended use context, rather than in a lab setting, constituted one of the primary reasons for my choice to apply DBR as a research methodology. The contextual focus corresponds with my reflections on Kairos, and particular the understanding that persuasive initiatives are only persuasive when applied within the intended use context. Thus, in order to evaluate the persuasive potential of a design, testing must take place in the relevant context.

Moreover, several learning theorists argue that context matters in relation to learning and knowledge processing (Christensen et al., 2012). Wenger argues that participation and engagement in the local context is a fundamental to the construction of knowledge. In the process of generating new knowledge, focus is often directed towards the global societies rather than local communities. However, while we may be able to participate in global societies we do not engage in them (Wenger, 1998). This taken into consideration, I found that testing the prototype in context was and remains essential not only in relation to establishing the persuasive potential of the design, but also to my own research aim to acquire insights

regarding methodological frameworks for persuasive design. It was through engagement and participation during the test phases that I would become able to construct knowledge, which could subsequently be transferred to more generally applicable directions for persuasive designs.

TRANSFERRING DOMAIN EXPERT INSIGHTS INTO PHASE 3

As explained in Chapter 4, the qualitative data collected through collaboration with domain experts was not only brought into consideration during the design phase, it also contributed to significant insights regarding the appropriate manner of testing and evaluating the design in practice.

Similar to the requirements and principles presented for consideration in the design phase, the following table provides an overview and exemplification of how the insights of the domain experts influenced this 3rd phase of the DBR process.

Source	Principle	Action taken
Education and training officer Aalborg	Information is only perceived relevant when disseminated by an officer in command	Instruction and education officers and sergeants were actively involved in the tests and evaluations
Workshop II	Basic military training is overloaded with subjects to cover in very little time.	Testing was planned in accordance with already scheduled learning activities
Education and training officer Almegaard	Conscripts are young and some struggle to read. Everything must be kept simple. Testing must be done in consideration of the additional activities of the basic military training	Information to conscripts regarding the test and the evaluation process (including consent) was kept simple and short During the tests, it was considered that the conscripts were tired due to having been marching in terrain the day before, thus they were awarded more breaks than usual. Evaluation surveys were kept very short, and based on Likert scales

PRE-PILOT STUDY AT AALBORG KASERNE

Prior to testing the persuasive learning design with conscripts at Almegaard Kaserne, a pre-test involving 9th semester Master students in Information Architecture was conducted at the other pilot establishment, Aalborg Kaserne. For the students, the visit to Aalborg Kaserne was a way to include field work in their elective course in persuasive design, and to reflect upon the theoretical perspectives on persuasive design, in relation to a practical example.

From a research perspective, the pre-test contributed to vital insights prior to involving the conscripts. Firstly, by conducting the test at Aalborg Kaserne, it was established that the prototype was applicable in more than one army establishment – thus considering the previously mentioned requirements to the design. Secondly, as the involved students were at the end of their studies, they were able to contribute with expertise in information architecture, thus providing an evaluation of system features, which could not expectedly be addressed by conscripts or other domain experts. During this pre-test, data was collected onsite through photos and field notes.



Figur 23 - Attention pre-test with Master Students

As most students had never been to an army establishment before, and none of the students were familiar with Aalborg Kaserne, a simple map of the perimeter was sketched to facilitate the students in finding their way to the designated locations and colour cards. The map was found even more important as we discovered that Aalborg Kaserne has multiple workshops and vehicle washing areas, and as such, even employees who work on the establishment daily, would need more distinct directions than provided in the system, in order to locate the colour cards.

Consequently, it was decided to also provide maps for the testing at Almegaard Kaserne. It was discussed if the maps should be integrated into the system, but decided against. This to ensure that the

individual conscripts did not spend too much time interacting with the screens, and also in consideration of the previously mentioned focus on simulating situations where the conscripts would have to focus on multiple things at the same time. For this purpose, the maps were argued to be a simple yet realistic addition to the existing design.

Amongst the more important results of the students' evaluation of the system, were their input with regards to system feedback and praise as well as to the system instructions about designated locations. In the initial prototype, feedback was provided through sound and text. However, the students argued that the quality of sound was poor and that the element of competition made them overlook feedback about correct or incorrect answers. This was considered problematic, as conscripts would potentially answer questions incorrectly, and not become aware of what action they should have taken instead.

In order ensure that the learning potential of the design was not diminished by the game aspect, system feedback was extended to also include colour feedback



Figure 24 . System feedback indicating that the scenario has been answered correctly but that the acquired colour code is incorrect

Upon returning with the acquired colour code, the system would provide feedback through a combination of simple text, recognizable icons, and the combination of red and green colours. Moreover, the correct answer to the scenario would also be emphasised by the colour green, and a 5 second delay was added to the system if scenarios were answered incorrectly.



Figure 25 - Correct answer to scenario, indicated in green.

The distinct choice of the colours red and green were based upon research in ambient persuasion conducted by Haam and Midden, who argue that not only do humans have a pre-understanding of the red/green colour combination, but also that ambient persuasion, such as what is provided through this type of system feedback, requires little cognitive effort by the user (Ham, 2010). Thus, the feedback was expected to be more easily processed by the conscripts, whilst maintaining a primary focus on the learning material.

TESTING ATTENTION AT ALMEGAARD KASERNE

Having refined the system on the basis of the pre-test, preparations for testing the design with army conscripts at Almegaard Kaserne took place. At the time, it was planned that the learning design would undergo several iterations of tests with conscripts, in order to evaluate not only the learning potential and persuasive impact of the system, but also a more stringent evaluation of the systems applicability across different military establishments and the long term learning potential of the design. Consequently, the test conducted at Almegaard Kaserne on Bornholm was planned with the distinct focus on exploring the potential of applying location and situation-based games when educating conscripts. Moreover, the evaluation sought to investigate the motivational impact of the learning designs, in order to reflect upon its potential to motivate a more positive attitude towards the subject of waste management.

Prior to the actual test, the design group attended a meeting at Almegaard Kaserne, with domain experts represented by the education officer in

command of the conscripts, the establishment manager at Almegaard Kaserne, and the environmental coordinator from the DDEIO. The aim of the meeting was to ensure that domain experts were involved in refining the design solution, approving the content, and exploring different opportunities of testing the system with conscripts (Appendix B). In collaboration with the environmental coordinator it was decided to maintain the scenarios as this would ensure comparability to the EDL.

The education officer in command particularly emphasised that the conscripts were very diverse, and that the scenarios in his opinion were too complex. Moreover, he responded positively towards the element of competition in the design, stating that *“Conscripts like competition, they will compete in just about anything, just to win bragging rights”*.

While all conscripts are required to complete environmental education during their basic military training (Ministry of Defence, 2012b), it is up to the individual education and training officers to plan and prepare the course. At Almegaard Kaserne, the environmental education was planned to be included in a 3-day activity during which the conscripts would also be taught firefighting and first aid. At the time, 62 conscripts remained at Almegaard Kaserne. The number had been higher, but some had left the army due to physical injuries and others had already been accepted for further military education.

To accommodate the course plan which had already been made, it was decided that the environmental education would be completed through the test of the persuasive learning design, and as such run over a duration of 3 days. The conscripts were already divided into three segments, and the segments would then rotate between the three subjects.

Although it was expected that the persuasive learning design would have a higher perceived credibility if presented by the officer in command, the officer preferred to just introduce me and leave further instructions to me. I presented the activity, the instruction film, and gave the subsequent orders for the conscripts to proceed to the touch screens and register in groups. Even though I did appreciate the opportunity to give military orders and actually see them carried out, it did impose a challenge with regards to evaluation, as my dual role as observer and instructor challenged my ability to collect observation notes during the first phase of the learning design. To accommodate this, two Master students from Aalborg university were invited to join the test phase and contribute to the observation process

ITERATIVE CYCLES OF TEST AND REFINEMENT

Testing of the persuasive learning design took place on November 4-6, 2013. Data collection during the test phase was conducted through observations, photo documentation, in-situ interviews with conscripts, and also by a short questionnaire which the conscripts were asked to fill out after having completed the Attention game.

Moreover, as the test was conducted within a closed environment, touch screen activities and conscript communication was captured by use of go-pro cameras located at two different angles above the screens. Due to the previously mentioned issues regarding security clearance, the films are not included in this dissertation; however, they contributed to the analysis of different situations by providing more angles and depth than what was grasped solely from photographing the events. To support the qualitative evaluation, quantitative data was extracted from the touch screens after all tests were conducted, thus supporting the evaluation of learning potential with documentation of the conscripts' results in the Attention game. A broader description of the test and evaluation phase is included in Appendix D, whilst the following sections aim to highlight the adjustments made in between test iterations and significances which are brought into consideration in the final phase of the DBR process.

62 conscripts participated in the test, which was conducted over 3 days. As previously described, the conscripts were first assembled in the auditorium, where I introduced the design, along with explaining my position as a researcher and the type of data material I would be gathering. The conscripts were presented with the introduction film, and subsequently informed to change into running shoes and report by the touch screens.



Figure 26 - Conscripts viewing the instruction film in the auditorium

The conscripts showed interest and engagement as they watched the instruction film. It was for instance noted that although the conscripts were visibly tired from the march in terrain, they did not sink into the soft seats of the auditorium, but instead discretely went to stand up against the wall if they found themselves losing concentration. It was also noted that even though the introduction film was only 11 minutes long, it remained heavy on information, and called for a further categorization of the presented content (Appendix D).



Figure 27 - 1st segment of conscripts preparing for Attention

Upon arriving at the location of the touch screens, the conscripts were provided with chip bracelets and a brief introduction to the game, before being instructed to register as groups on the screen. Groups were naturally formed based on sleeping quarters. One of the benefits of having the conscripts register in themselves in the game manually, was that they became acquainted with the screens and using the chip bracelets prior to

playing the game. Once the game was started no more instructions were given from the design team, but the activities were observed and photo documented.



Figure 28 - Conscripts waiting to access the touch screens

During the first day of testing, it became apparent that groups should not consist of more than 4-5 members, as higher numbers of groups resulted in the conscripts having to spend too much time waiting to get access to their group screen and thus not being as physically active as required. This was amongst the revisions taken into consideration the following days, where conscripts were instructed to not form groups larger than five members.



Figure 29 - Map orientation followed by much running...

Over the duration of tests, the conscripts were perceived as engaged and positive towards the learning activity. A distinct transition was noted amongst the conscripts in their way of engaging in the auditorium,

compared to the activity during the Attention game. While the conscripts were focused and concentrated in the auditorium, the game activities motivated a more relaxed and playful atmosphere perceived through the observations of group collaboration and friendly mocking the competition.

Amongst the more significant observations, was the level of collaboration amongst the group members. They had been informed prior to the game that they were allowed to help each other, and moreover that the order of scenarios as well as the different solutions were presented randomly every time. Thus conscripts would not get the same scenarios nor would the order of solutions be the same. It was observed that the conscripts very often articulated their reasoning for choosing a specific solution to a scenario. Both when working independently but also when collaborating with group members.



Figure 30 - Conscripts discussing how to dispose of water from cleaning the floors in the army barrack sleeping quarters

In the example above, one conscript was in doubt about how to dispose of the water after having washed the floor in the army barracks. Rather than simply point to the right answer and say

”it’s that one”, his group member explained that” we can pour it down the normal drain. They said in the film that we only use eco-friendly soaps inside barrack buildings”

(Appendix D).

The richly articulated collaboration between group members was perceived as a positive indication of the potential of the persuasive learning design for several reasons.

Firstly, by demonstrating the ability to not only understand and act upon the presented material, but also convey the material to fellow group members, the conscripts indicated a deeper understanding of the learning material. This was particularly important as the scenarios were not identical to the examples provided in the introduction film, but merely similar situations. As such, the conscripts were demonstrating the ability to transfer their knowledge on appropriate behaviour to other situations. Secondly, the knowledge sharing amongst conscripts in combination with the generally relaxed fun atmosphere were noted as a positive indicator that the approach to learning also had the potential to motivate a positive attitude towards the subject of waste management.

“For fuck sake Havnsø! How can you be that bad at waste management?! You confirm all allegations that women are better at multitasking than men”

(Appendix D)

The element of competition between segments was identified as being far more pervasive than anticipated. Although smiles were on throughout the game and spirits were high, harsh remarks were given when team members did not do well, as exemplified in the above quote. Moreover, it was noted that the individual competition between conscripts, prompted those waiting for their turn to play the game, to also join in with advice from the side line. E.g. it was noted that the conscript Herstedvester was generally known as being one of the most fit and accomplished conscripts, and as such, the fellow members of his segment took particular pride in beating his scores, exemplified by the following quote.

“Fuck yeah – I scored higher than Herstedvester. I gotta go rub his nose in it”

(Appendix D)

Even though the feature of competition was based on a combination of theoretical reflections (H. Oinas-Kukkonen & Harjumaa, 2009) and input from domain experts (Appendix B), it was noted by several observers that this distinct feature of the design could potentially over shine the learning material and potentially result in the conscripts finding the game fun and engaging, but not educational.

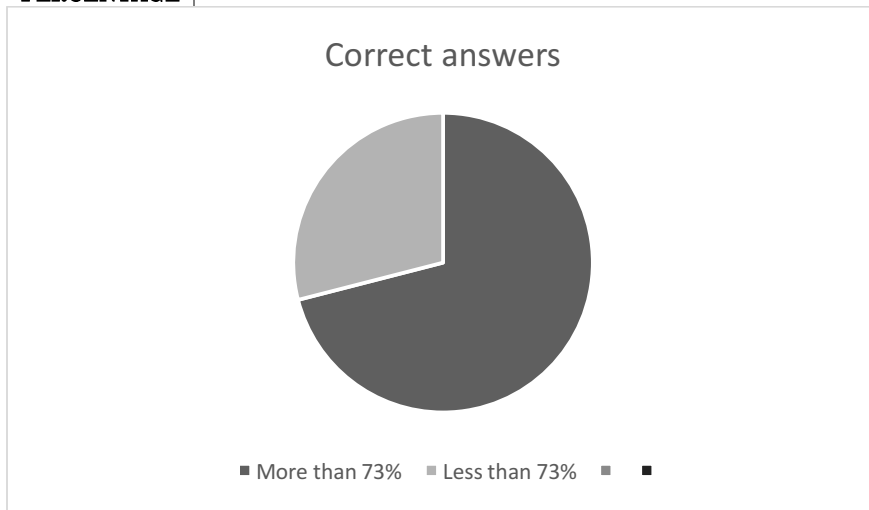
RESULTS AND EVALUATION

While the observations and photo documentation of the tests ensured that significant situations were captured, a more stringent evaluation of all three tests were conducted through a combination of a short survey and data extracted from the Attention touch screens. Moreover, the test was concluded by a meeting between the design group, the educational officer in command, and the establishment manager, during which they were able to contribute with their thoughts and ideas.

GAME RESULTS

Data extracted from the Attention touch screens provided the following overview of the conscripts results:

CORRECT ANSWERS	3/11	4/11	5/11	6/11	7/11	8/11	9/11	10/11	11/11
NUMBER OF CONSCRIPTS	1	2	2	4	9	14	15	11	4
RESULT IN PERCENTAGE	1,6	3,2	3,2	6,5	14,5	22,6	24,2	17,7	6,6



Due to the odd number of scenarios in Attention, a direct comparison to the required 80% correct replies in EDL is not possible. However, results from the test show that 71% of the recruits were able to complete the game with a score of more than 73% correct answers. In the interpretation of data, it is important to also remember that Attention is not directly

comparable to the EDL, as the content of Attention is limited to only include material which is considered relevant to the conscripts and segments with similar activities and responsibilities. This in accordance with the Ministry of Defence's strategy for digitalisation of learning material (Ministry of Defence, 2013). When discussing the results with the instruction and education officer in command at Almegaard Kaserne, it was furthermore brought to our attention that some of the scenarios were in fact beyond what the conscripts would be expected to know. E.g. conscripts are not involved in vehicle maintenance and may as such not be aware of the waste water management in this particular situation.

CONSCRIPT EVALUATION RESULTS

Immediately after completing the Attention game, all conscripts were asked to anonymously fill in a short survey, indicating their level of agreement with the following three statements:

1. It is important for me to know how to manage waste correctly and how to respond in case of disaster situations
2. The Attention game made it fun to learn about how to look out for the environment
3. I will be able to use what I have learned to day, in the future

The goal of applying the survey was to ensure that the evaluation of the system would include quantitative data not only regarding the conscripts' ability to score sufficient points in the game, but also about their attitude towards the learning design and the learning material. This to ensure an equal evaluation of both the intended learning outcomes and motivational goals, as previously presented.

The surveys were filled out as the conscripts were catching their breaths after the game activity, spirits were high and the situation enabled the surveys to be supported by in-situ interviews with the conscripts. Survey results provided the following insights:

	Rating:1	Rating: 2	Rating:3	Rating: 4	Rating: 5	Av
S: 1	3 (5,00%)	1(1,67%)	9 (15%)	22 (36,67%)	25 (41,67%)	4,08
S: 2	1 (1,67%)	5 (8,33%)	5 (8,33)	19 (31,67%)	30 (50%)	4,20
S: 3	1 (1,67%)	8 (13,33%)	12 (20%)	16 (26,67%)	23 (38,33)	3,87

From the survey, it was indicated that:

- 78,34 agree or strongly agree that knowledge about appropriate environmental behaviour is important to them
- 81,67% agree or strongly agree that the Attention game made learning about waste management fun
- 65% agree or strongly agree that the knowledge they have acquired through the learning design is applicable in the future.

While the results of the first two statements were found positive and quite acceptable, it was noted that the learning design required optimizations with regards to clarifying the long term relevance of the learning material. It was suggested that this might be achieved by extending the inclusion of examples from both civilian activities and those which take place within the military context.

Moreover, during conversations with the conscripts, several of them noted that they were not sure that they had learned much new, but they appreciated the confirmation that what they were already doing was correct. This taken into consideration, it may be that the slightly lower evaluation of the future relevance of the acquired knowledge, may be based on some conscripts not feeling that they have learned much at all.

EVALUATION WITH EDUCATIONAL OFFICER IN COMMAND

The testing at Almegaard Kaserne, was concluded by an evaluation meeting with representatives from the design group, and with domain experts represented by the Military Establishment Manager and the Education and training Officer in Command of the participating conscripts. The officer in command had as previously mentioned been involved during both the preparation of the test and the test phases themselves, while the establishment manager had joined the tests occasionally.

From the evaluation, the domain experts raised the following two primary critiques of the learning design:

- The examples provided in the Attention game were not all directly relevant to the conscripts, and as such the acquired knowledge might be hard to transfer to their daily practice
- The scenarios presented in the game were too long and complex, and as not all conscripts are adept readers, some would have trouble completing the game.

However, on a general level, the learning design was received very positively. It was in particular noticed that scenario based learning is not unusual in the army, however it often requires a lot of preparation and

several educational officers in order to manage all different locations. It was noted that the Attention game enabled scenario based learning to be facilitated by just one educational officer. Moreover, it was argued that the learning design held much potential as a supplement to situations where not all conscripts in a segment could be active at the same time. E.g. it was argued that when the conscripts train on the shooting range, not everyone can shoot at the same time. Rather than just wait, the Attention game would enable the waiting conscripts to remain active and test their theoretical knowledge about weapons management.

The critique of the relevance of the content was immediately taken into consideration, and it was agreed that the officer in command would participate in optimising the scenarios prior to the next iteration of testing the system.

Although the critique of the complexity is understandable, I argued that a simplification would not be beneficial from a learning perspective. It was explained that it was not expected that the conscripts would learn much while interacting with the game, but that the game was designed partly to accommodate the strategic requirement of documenting that the conscripts had acquired knowledge about appropriate environmental behaviour (Ministry of Defence, 2012b) and partly to motivate a positive attitude towards the subject and active dialogue amongst the conscripts. In consideration of Wenger's theories of communities of practice (Wenger, 1998), appropriate environmental behaviour and opinions regarding sustainability were expected to be established through the community of practice of the conscripts. As such the aim of the Attention game was not to educate, but to spark conversation, and to ensure that conscripts recollect environmental education as a positive and relevant experience.

PHASE 4: GENERATING NEW KNOWLEDGE

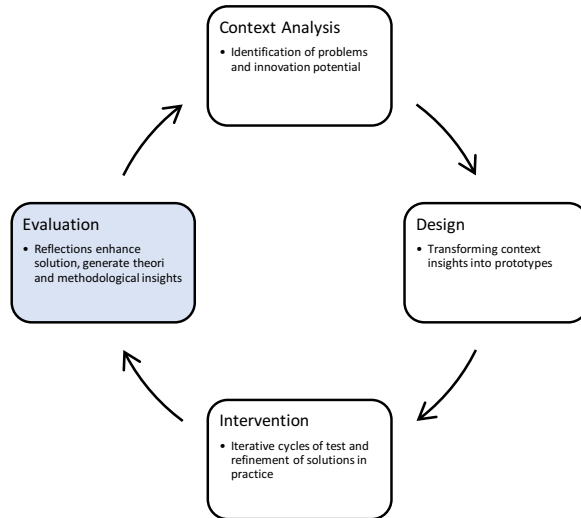


Figure 31 - Adaptation of DBR process, Phase 4

As described in Chapter 4, the fundamental principle of Design Based Research (DBR) is to generate new knowledge through iterative processes of designing, testing and refining designs for learning (Christensen et al., 2012). Within the DBR context *designing* refers to the practise of optimizing or improving a learning environment and as such can involve either optimizing the application of existing learning artefacts, or developing new artefacts for the intended use context (Christensen et al., 2012). In the previous sections of this chapter, I have presented the process during which I have contributed to the development of a persuasive learning design for conscripts in the Danish army including the process of designing a new technological platform for learning within the intended use context.

Concurrently, the focus of my own research has been directed towards investigating:

- What defines persuasive design as an approach to behaviour design, which is applicable both in theory and in practice?
- What defines a persuasive learning design and in what ways do theories and of learning and knowledge processing contribute to the definition of persuasive design?

- How can different perspectives of persuasive technology and persuasive design be applied in the development of persuasive learning designs?
- Is it possible to develop a methodological approach to persuasive design, which bridges between system-oriented design features and user-centred perspectives?

As previously explained, my research approach may be defined as exploratory, as persuasive designs for learning constitutes a field which has been only scarcely investigated. Thus I do not strive to provide conclusive answers, but to acquire insights and understandings of the relationship between persuasive design and learning, as well as to generate directions for a persuasive design methodology.

An implication of the approach, in combination with the focus of my research interest, is that rather than emerge myself deeply into the analysis of specific aspects of the design process, I seek to apply a wider lens as I explore the process in its entirety. This perspective towards the process allows me to reflect upon and discuss the relation between persuasion and learning in practice, and it is through my rich description of the process that I am able to exemplify how perspectives from the persuasive technology field have been applied in the process, and what significant contribution this has made to the design.

Rather than address each research question individually, this section will summarize my newfound understanding of the cross-field between persuasion and learning and argue towards how these two fields may reciprocally benefit from each other. Subsequently, I combine my theoretical benchmark established in Chapter 3, with the insights gained during the different phases of the DBR process, in order to generate directions for a persuasive design methodology.

LEARNING IN PERSUASIVE DESIGN

During the first phase of the design process, as I sought to establish a theoretical foundation for the subsequent phases of the design process, particular attention was directed towards both the overlaps and also distinctions between persuasion and learning.

The term learning is generally broad, and often used with different meaning. However, according to Illeris, the most often applied perceptions of the word refers to outcomes of a learning process, mental processes within an individual, and interaction processes between individuals, their material and their social environment (Illeris, 2007).

In my perception, the particular importance of these distinctions is that learning is something which takes place within the individual, and that the overall intention of any learning design is to facilitate the learning process. As such, it must also be acknowledged that learning does not necessarily take place during the interaction with a learning technology, but that the technology may be one of several factors facilitating the learning process.

By reference to Miller (Miller, 2002), persuasion in my understanding shares similarity with learning in the sense that persuasion also constitutes a process during which a person is influenced by one or more persuasive initiatives. When considering the rhetorical notion of Kairos, and in particular the dimension of appropriate manner, I find that not only does the dimension call for participatory design, it also requires careful reflections regarding the user's ability to process whatever persuasive initiative is being mediated. It is with this in mind that I argue that theories of learning and knowledge processing, such as Piaget's categorization of *assimilation* and *accommodation* holds much potential with regards to strengthening the theoretical foundation of persuasive design.

As suggested in Chapter 3, persuasive design distinguishes itself from other approaches to behaviour design, such as nudging, not only by being a more ethical and transparent approach to influencing others (Atkinson, 2006; Miller, 2002), but also by the intent to facilitate a continuous behaviour change. Although tacit within the persuasive technology field, I find that the identification of *health* and *sustainability* as the most dominant application domains for persuasive technologies, indicates that this understanding does not conflict with the field in general. Moreover, the understanding that the goal for persuasive technologies is to motivate such continuous behaviour change, is further supported by Spahn, who argues that “*ideally the aim of persuasion is to end the persuasion*” (Spahn, 2011), understood in the sense that persuasive initiative become superfluous once the behaviour change becomes permanent

In Fogg's original definition of persuasive technologies, he presented Captology as the cross-field between interactive technologies and social psychology (Fogg, 2003). Fogg did reference classical rhetoric, and with the establishment of an international research field, several researchers have argued that this classic humanistic field holds much potential in relation to persuasive technologies (Ehninger, 1972; Glud & Jespersen, 2008; S. B. Gram-Hansen & Ryberg, 2013; Hasle & Christensen, 2007; Pertou & Iversen, 2009).

Through the process of this Ph.D. project, I have come to the understanding that learning as a research field may contribute as a third theoretical benchmark for the successful development of persuasive designs and persuasive technologies. Providing theories and methods to investigate and consider how users potentially process the persuasive intent mediated to them through design, thereby facilitating a more substantial consideration of Kairos and the dimension of appropriate manner. I argue that if the intent of a persuasive design is to facilitate a continuous behaviour change, such change must inevitably be based on an attitude change within the user. In order for a user to change attitude towards a given subject, he or she must process new insights and thus learning may be argued to be a requisite for transparent and ethical persuasion.

PERSUASIVE DESIGNS FOR LEARNING

In the previous phases of the DBR process, I have explained and exemplified not only my design and implementation process, but also provided examples of how the persuasive design framework presented in Chapter 3 was taken into consideration. Moreover, I have provided examples of how distinct persuasive system design features have been applied in the design.

The persuasive learning design bridges between the intended use context and the persuasive technology, by thoroughly considering the context in the system development, and by actively applying the context as part of the design. The latter is done not only through the inclusion of locations on base, but also through the mediation of scenarios which the conscripts could potentially have to handle.

As I analysed the existing learning technologies in the first phase of the DBR process, it became evident that several of the features referred to as persuasive, were already applied in the two systems. Similar results were found during the PLOT project, as I applied Fogg's Functional Triad as a framework for analysing the technologies involved in the project (S. B. Gram-Hansen et al., 2012). Consequently, I argue that the potential of persuasive design and persuasive technologies in relation to learning is not to improve learning technologies by adding persuasive principles and features to existing learning technologies.

Rather, the potential of persuasive design in learning may be found in the ability to motivate learners to engage in the learning activities, thus supporting them in complex tasks such as accommodating new knowledge. This understanding of persuasive designs for learning is based on the

evaluation of the persuasive learning designs for conscripts, in which it became evident that while the conscripts found the learning design fun and engaging, the measured learning results and the perception of relevance from the conscripts were not scored equally high.

The less impressive learning results may be excused by several parameters, such as learning content being insufficiently tailored for the learners, and competitive elements of the design being too dwarfed. However, the most important factor remains that the intent of the learning designs was not to facilitate immediate learning, but to motivate a more positive attitude towards the environmental education, and to inspire the conscripts to articulate their knowledge and communicate with each other about the content. Wenger argues that learning within a community of practice is based on the establishment of mutual understandings and that this is a time consuming process (Wenger, 1998). All things taken into account, I find it reasonable to presume that the learning results would be improved, had it been possible to perform another test of the conscripts at a later time in their military education.

As I elaborated on my understanding of Kairos, I argued that *context matters* as persuasive technologies are only persuasive when applied within the intended use context. In addition, I would add, that persuasive system features may only be persuasive, when implemented in accordance with context oriented reflections. E.g. the inclusion ambient persuasive colour feedback within the system, was found highly appropriate within this distinct context, where conscripts were required to remember several things while running at high pulse. By applying feedback methods that require little cognitive effort, conscripts could focus their intention on the details of the learning material instead. It may however be that similar learning systems in other contexts or even within the military context but tailored for other segments, require other types of user feedback.

Throughout the design process, much attention has been directed towards considering the appropriateness within the intended use context, and it is from these reflections that the EDL has been transformed into the persuasive learning design presented here. Amongst the significant differences between the EDL and the persuasive learning design for conscripts, is the distinct focus on developing a system which is interactive, applicable within the intended use context, and which motivates the conscripts to collaborate. Hence, I find it indicated that a potential contribution of considering persuasive design in relation to learning, is constituted by motivating learning designers to consider the potential of the context, rather than the limitations, and to explore different ways of interacting with the system, depending on the intended

use context. Thus, persuasive design in learning may facilitate the design of more constructivist learning technologies.

Finally, by identifying the potential of persuasive design and persuasive technology features as motivational rather than an improvement of learning, I refer not only to the theoretical perspectives presented and discussed in the previous chapters, but also to the PLOT project pilot study presented in Chapter 2. Evaluation of the pilot study showed that the students found the persuasive learning design, fun and engaging. Similar to what was identified from the observations of the conscripts, a change of atmosphere was identified amongst the students in Vester Hassing with light and playful conversation as they completed the mobile learning design. However, evaluations indicated that the learning design in itself did not necessarily facilitate better learning, it rather served as a motivating kick-start to a more thorough exploration of WWII and the Danish resistance against the German occupants. Thus, a distinction between the results in PLOT and those achieved with Attention is that while the first design may constitute what is referred to as chocolate covered broccoli (Glasemann et al., 2010), the latter was designed with the more distinct intention to motivate and engage learners.

EDIE – TOWARDS A PERSUASIVE DESIGN METHODOLOGY

As I conducted my literature review of the persuasive technology field, I initiated the process by reference to the findings made by Torning and Oinas-Kukkonen. Amongst their presented arguments, were that the field of persuasive technology were not directing enough attention towards combining classic ontological discussions with modern system design, ethical concerns were not given enough attention, and there was an identified lack of empirically tested conceptual models for persuasive system design (Torning & Oinas-Kukkonen, 2009).

Based on a combination of the theoretical foundation established in Chapter 3, and the experiences acquired through the initial phases of the DBR process, this final section of the chapter elaborates on the initial steps towards a methodological framework for persuasive design which I refer to as EDIE. In this process, I return once again to my understanding of exploratory research. As previously described, exploration most often takes place prior to the establishment of an actual relation, and the aim of the approach is not to provide conclusive solutions, but rather to generate preliminary assessments (Shields & Rangarajan, 2013). It is through this particular lens that the current version of EDIE should be considered. Not as a conclusive recommendation for a persuasive design method, but as initial steps towards an approach which will encompass the different

methodological tendencies which have influenced the persuasive technology community over the past decade.

EDIE is inspired by DBR, but amongst other things distinguishes itself by a particular focus on constructive ethics. Due to unforeseeable changes in my position at Aalborg University, the framework has not been empirically tested, and its potential not documented. In its current version, the framework as a whole, as well as the individual phases, are based on criteria derived from evaluation of the DBR process presented previously in this chapter, combined with theoretical underpinning from the persuasive design perspective presented in Chapter 3.

In the following section, I strive to clarify the underpinning of EDIE on a general level as well as the individual phases of the method.

Source	Principle/criteria
Theoretical underpinning	<ul style="list-style-type: none"> • Must bridge between context and persuasive system • Must consider persuasive system features • Must consider ethics throughout the design process • Must consider user's understanding of intended use context • Must consider user's ability to process content
Insights completed from DBR process	<ul style="list-style-type: none"> • Design is iterative • Testing takes place within the intended use context • Ethics is applied constructively throughout the process • Distinguish between domain experts and subject matter experts
Design group feedback	<ul style="list-style-type: none"> • Collaboration with domain experts should be more continually integrated in the process • In complex organizations domain experts should represent different contexts • Process should be initiated by a workshop involving both SME's and domain experts.

As described in Chapter 4, the DBR methodology distinguishes itself from other similar approaches to research by the distinct focus on collaboration between domain experts and designers, and by insisting that designs

should be tested and evaluated within their intended use context. These two characteristics were argued to be particularly relevant in consideration of Kairos, and consequently, I argue that they also apply to EDIE. However, EDIE distinguishes itself from DBR by its focus on design rather than research and by distinctly calling for a participatory mindset throughout the process, rather than the vaguer notion of collaboration.

As described in the previous sections of this chapter, ethics was considered constructively throughout the design process by references to Løgstrup's ontological ethics and arguments towards an *ethical demand* and in consideration of what he refers to as *Sovereign expressions of life* (S. B. Gram-Hansen & T. Ryberg, 2015; Løgstrup, 1997). In practice, the application of constructive ethics not only influenced the individual phases of the process, but also facilitated the transfer of knowledge between the phases.

A fundamental feature of applying this approach to ethics, was that designers, SME's and domain experts were all involved throughout all four phases. Most often, all members of the design group were represented during participatory design activities with domain experts, and as such, these activities not only facilitated that principles and design concepts were designed collaborately. By having all members of the design team share the experiences of collaborating with domain experts, it was found that the transferral of knowledge between phases was more easily achieved. This may be explained by reference to Wenger's theory of communities of practice, and the notion of learning being a product of social interaction and negotiation rather than knowledge processing and dissemination (Wenger, 1998). By having collaborately constructed the meaning of the different encounters with domain experts, knowledge is transferred more smoothly, compared to situations where only a select few representatives participate in such encounters and then subsequently share their insights with the remaining designers.

Inspired by the first 3 phases of the DBR process, EDIE is constituted by four phases; *Explore*, *Design*, *Implement* and *Evaluate*. The process is iterative on two levels:

1. Applying EDIE is a continuous process, and all four steps may call for several iterations
2. Each of the phases in EDIE represent individual iterative processes.

The recognition that EDIE is a continuous process is partly related to Millers understanding of persuasion as a process (Miller, 2002), and partly to the acknowledgement that once a technology is implemented in a context, the context becomes altered and as does the users perception of that context.

An important distinction between DBR and EDIE, is also found in the intent of applying the framework. Where DBR constitutes a research framework, EDIE is meant to be a conceptualised design framework.

The basic aim of the EDIE method is to facilitate the described bridge between user-centred and system-oriented approaches to design, by providing direction and guidance for persuasive design practitioners. The connection between the different phases is facilitated by ethics being applied continuously throughout the design process. The implications of these distinctions are further elaborated upon in the following.



Figure 32 EDIE, visualised as an iterative continuous process

EXPLORE

Contrary to the first phase of the DBR process, the EDIE explore phase aims to explore the intended use context, and to identify innovation potential with regards to facilitating an attitude or behaviour change. Hence, the phase is inspired by Christensen's DBR innovation model (Christensen et al., 2012), but distinguishes itself from DBR in general, as problem identification is not given the same regard in EDIE. From the theoretical framework presented in Chapter 3, it is understood that persuasive design springs from the intent to change a person's attitude and/or behaviour, hence, the problem will have been identified prior to initiating a design process.

Exploring the context is primarily done through field research and should aim at e.g. establishing what defines the optimal behaviour in the given situation and why this behaviour is not already established. Exploring the context should be done in collaboration with both SME's and domain experts. In accordance with the theoretical framework presented in Chapter 3, the participatory approach not only ensures that the designers

gain a deeper insight with regards to appropriateness within the context, it moreover acknowledges the need for transparency in the design.

Participatory design when applied in this phase, involves designers, SME's and domain experts, and should strive to specify the intent of the design and facilitate the definition of appropriate behaviour within the intended context. The aim of applying a participatory design approach in this phase is to ensure that the design is driven by the collaboratively established intentions of the designers and the users.

DESIGN AND IMPLEMENTATION

Based on the insights acquired through the explore phase, the design process comprises the steps taken towards developing a persuasive technology which holds the potential to be efficient yet unobtrusive when applied within the intended use context. While the individual steps of the design process may vary depending on the context and the technology, participatory design remains a requisite and ethics should continuously be considered constructively.

While continuous collaboration with domain experts may initially be perceived as time consuming, the approach also has distinct benefits. From the evaluation of the DBR process previously described, it was recommended by the design group that the design process should be initiated by a workshop involving designers, SME's and domain experts.

It was mutually understood that the participatory approach not only ensured that the context was more distinctly considered during the design process, but more importantly the collaboration with domain experts also served as an initial influence on their attitudes towards the persuasive design. E.g. while the educational officer in command of the conscripts on Bornholm was sceptical during the pre-test meeting, his active involvement during the test and refinement process positively influenced his attitude towards the learning design.

Moreover, it is through collaboration with domain experts that applicable persuasive design features could be defined and implemented appropriately into the system. As previously mentioned this was the case when ambient persuasion was considered in relation to the Attention game, and when some of the artefacts suggested by the technical developers were rejected by domain experts. More specifically, the technical developers had suggested that a large flashing red indicator would make the screens more visible and intensify the experience of the

game. However, the idea was immediately rejected by the participating domain experts.

Consequently, it is argued that the potential of a participatory mindset in EDIE not only facilitates the establishment of appropriate manner within the intended use context, it furthermore initiates the persuasive process visualized by the three steps towards continuous behaviour change. Through participatory design activities, the notion of appropriateness within a given context is established through social interaction and collaboration, and it is through this continued social interaction in the design process that the attitude change is initiated.

As previously mentioned, test and refinement is conducted within the intended use context. In consideration that the implementation alters the context, I argue that the designers and developers should aim to release the system and quickly withdraw to a more observant position. However, also the implementation itself may benefit from the insights of the domain experts, in order to ensure that the time and place of implementation is both suitable and effective.

EVALUATION

Preece, Rogers and Sharpe argue that the point of an evaluation is *“to check that users can use the product and that they like it, particularly if the design concept is new”* (Preece, Rogers, & Sharp, 2007). Approaches to evaluating interactive systems vary, and as such the designer must clarify not only what needs to be evaluated but also when and how the evaluation should be conducted.

Without disregarding the importance of evaluating e.g. the usability of a system, a distinct focus of persuasive design is to influence and potentially change the user’s behavioural pattern, and consequently the evaluation of persuasive design goes beyond evaluating the system.

Although many solutions enable the extraction of quantitative data which may serve as an indicator of user interaction and progress, I argue that persuasive designs moreover require qualitative evaluations with a distinct focus upon the user’s awareness of the persuasive design and potentially also the user’s perception of own progress towards adapting the intended behaviour change.

While some aspects of evaluation may be implemented into the system, others may require more field studies. Thus the evaluation process may

also facilitate the bridge into yet another exploratory phase and yet another refinement of the persuasive design solution.

SUMMING UP

In this chapter, I have described and exemplified the process of my research and design collaboration with the DDEIO and I have demonstrated how different perspectives from the persuasive technology field have been applied in practice. By this, I have sought to explore, analyse and discuss the implication of applying in practice, the notion of persuasive design as it is defined in Chapter 3.

Based on the insights gathered through the process, I have explored the relation between persuasive design and learning, and from this argued that learning holds much potential with regards to extending and optimizing the theoretical underpinning of persuasive design, and that the potential of persuasive design in relation to learning, is not to improve learning, but rather to motivate learners to engage in the learning process.

Finally, I have suggested the initial steps towards a methodological framework for persuasive design, which incorporates the theoretical and practical insights achieved through this project.

CHAPTER 6. OVERVIEW OF INCLUDED RESEARCH PAPERS

While the previous chapter sought to describe the process of my research collaboration with DDEIO, as well as point to some of the findings and reflections which I have found to be particularly significant, this chapter presents an overview of the research papers included in the thesis. The included papers have been selected partly as they contribute to the answering of my research questions, and partly as they also explicate my own process and development as a researcher.

In overview, papers I and II may be seen as elaborations of my theoretical underpinning of this project, addressing my distinction between persuasive technology and persuasive design, and the necessity of considering ethics throughout the design process. Paper III constitutes a further amplification of paper II, as it provides a more distinct example of how ethics may be considered constructively during a participatory design activity. Paper IV presents the initial findings from my DDEIO collaboration and more importantly my initial arguments towards the importance of considering theories of learning and knowledge processing in relation to persuasive design. Finally, Paper V presents the preliminary overview of EDIE.

PAPER I: PERSUASION, LEARNING AND CONTEXT ADAPTATION

*Gram-Hansen, S.B. & T. Ryberg (2013) **Persuasion, Learning and Context Adaptation**, Special issue of the International Journal on Conceptual Structures and Smart Applications*

This paper, which was published in a special issue of the International Journal of Conceptual Structures and Smart Applications, comprises a further development of a paper which I presented during the closing conference of the PLOT project. The conference was held as a workshop during ECTEL 2013, and aimed to both disseminate the findings of PLOT, but also to initiate a continued discussion in the Technology Enhanced Research (TEL) about the potential of persuasive design in learning. Out of the papers presented during the conference, some were selected for further elaboration and journal publication. Hence, this paper characterises the state of my research at the closing of the PLOT project, yet prior to my collaboration with the DDEIO.

In the paper I present some of the early findings of the literature study presented in Chapter 3 of this thesis, and argue towards the distinction between persuasive design and persuasive technologies, where persuasive design is considered a wider and more context oriented perspective, and that the notion of Context Adaptation, may be used to explain how persuasive design aims to create an appropriate balance between the context and the persuasive technology.

The included paper is the first written in collaboration with Professor Thomas Ryberg, who had at the time just assumed the role as principle supervisor of my project. It was greatly motivated by the frustration I experienced during the PLOT project, where I did not find that the theoretical framework of the project could sufficiently state the claim of persuasive technologies in relation to learning. However, the paper also constitutes my first steps towards expanding my theoretical understanding of learning, knowledge processing and the relation between persuasion and learning. Thus, I consider the paper a benchmark in my research as well as a springboard for my collaboration with the DDEIO.

PAPER II: ON THE ROLE OF ETHICS IN PERSUASIVE DESIGN

Gram-Hansen, S.B. and L.B. Gram-Hansen (2013) On the role of ethics in Persuasive Design, Ethicomp 2013, Syddansk Universitetsforlag

Paper number II was written in collaboration with Lasse Gram-Hansen, and was published during the Ethicomp 2013 conference where I also presented the paper. The paper elaborates on some of the arguments presented in Paper I, but focuses more distinctly on the role of ethics in relation to persuasive design.

Addressing that it is not only in relation to learning that the claim of persuasive technologies is hard to establish but also in the fields of digital dissemination of cultural heritage and information architecture, the paper argues that ethics should be considered a defining feature of persuasive design. The argumentation of the paper is primarily based on the perception of Kairos as being multispatial, and with a more distinct focus on understanding Kairos in wider and more philosophical sense than just a matter of timing.

The paper was written instantaneously with Paper I, and is thus also characterised by my endeavour towards establishing a claim of persuasive design in relation to more established research fields. Besides from the distinct focus on ethics, the paper sought to reinforce the relevance of this

effort, by expanding the view from learning to several other domains of expertise.

PAPER III: FROM PARTICIPATORY DESIGN AND ONTOLOGICAL ETHICS, TOWARDS AN APPROACH TO CONSTRUCTIVE ETHICS

*Gram-Hansen, S.B. & T. Ryberg (2015) **From Participatory Design and Ontological Ethics, Towards an approach to Constructive Ethics**, Ethicomp 2015, ACM SIGCAS*

The arguments presented in Paper II was further extended and potential more importantly exemplified by Paper III, which was written in collaboration with Thomas Ryberg, and published at Ethicomp 2015.

During the literature review presented in Chapter 3 of this thesis, it caught my attention that only very few of the included papers had a distinct focus on the ethics of persuasive technology, and that even fewer provided examples and directions for researchers and practitioners who seek to distinctly consider ethics in their work. Thus, with Paper III, I sought to not only elaborate my stance on ethics as a requisite to persuasive design, but also to provide an example of how ethics may be considered in practice.

In the paper, I argue that although Løgstrup's ontological ethics is often discarded due to its intuitive nature, it holds potential with regards to offering designers directions with regards to applying ethics constructively throughout the design process. With regards to practical exemplification, I describe how Løgstrup's ontological approach to ethics, and his notion of sovereign expressions of life, were taken into consideration during one of the workshops held with participants from the Danish army.

Although notions of power balance between participants is already addressed in participatory design, I argue that the reference to Løgstrup, extends the reflections to not solely focus on the participatory design activity itself and on the facilitation of participant interaction, but also on the implications the workshop activities may have in a wider ontological sense. Amongst these implications is the transferability of knowledge generated during e.g. a workshop, into the subsequent steps of the design process, which I find may be supported by considering the ethical demand between workshop participants.

PAPER IV: ATTENTION – INFLUENCING COMMUNITIES OF PRACTICE WITH PERSUASIVE LEARNING DESIGNS

*Gram-Hansen, S.B. & T. Ryberg (2015) **Attention – Influencing Communities of Practice with Persuasive Learning Designs**, 10th international conference on Persuasive Technologies, Springer*

In this paper, written in collaboration with Thomas Ryberg, I present the initial findings of my collaboration with DDEIO, and present the argument that theories of learning and knowledge processing holds particular relevance in relation to persuasive design. The paper was published and presented at the Persuasive Technology conference in Chicago in 2015.

Besides from discussing the relation between persuasion and learning, the paper argues that the multispatial perception of Kairos not only is ethics a requisite to persuasive design, so is participatory design. Designers may apply user-centred approaches to determine the appropriate time and place for a persuasive initiative to take place, however as the appropriate manner is based upon the user's perception of the context, this third dimension of the concept requires a participatory mindset.

The paper was significant to me as a researcher for several reasons. Firstly, the paper distinguished itself from the majority of my previous publications by being based on empirical research rather than literature research, and secondly, the publication constituted a far stronger contribution to the persuasive technology community than the work I had previously submitted.

PAPER V: THE EDIE METHOD – TOWARDS AN APPROACH TO COLLABORATION BASED PERSUASIVE DESIGN

*Gram-Hansen, S.B. (2016) **The EDIE method – towards an approach to collaboration based persuasive design**, Persuasive 2016, Salzburg, Springer*

Paper V – the final paper included in this thesis, was published and presented at the Persuasive Technology conference in Salzburg in 2016. In the paper, I present the very initial steps towards EDIE, exemplifying how the different phases of the DBR process inspire the phases of EDIE, but also pointing towards the areas in which EDIE distinguishes itself from both DBR and other similar methodological frameworks.

As mentioned in the previous chapter, a weakness of EDIE, is that it is not empirically tested and as such the potential of the method remains

undocumented. However, EDIE distinguishes itself by being the result of empirical research and a collaborative design process which took place in a real context setting.

Paper V summarises my argument that in order to consider Kairos in persuasive designs, methods must consider both the wider and the narrow understanding of the concept, and thus bridge between user-centred and system-oriented approaches to design. Thus also facilitating the establishment of an appropriate balance between the context and the persuasive initiative which I referred to in paper I as Context Adaptation.

CHAPTER 7. CONCLUSION

“There is nothing like looking, if you want to find something. You certainly usually find something, if you look, but it is not always quite the something you were after.”

(J.R.R. Tolkien, *The Hobbit* 1937)

As I wrote in the introduction, my initial impression of the Ph.D. process was highly romantic and filled with high expectations. Some of which were fulfilled perfectly, while others were discarded down the tangled and bumpy road which constitutes my process and progress as a researcher. Much looking has been done, and much has been learned, and very little has turned out as I expected when I took my first steps into this Ph.D. project.

I was, and remain greatly intrigued by the notion of designing interactive technologies with the intent to change user’s attitudes and behaviour in an ethical manner. Having been actively engaged in the persuasive technology community for eight years, published research, and partaken in most of the annual conferences, I have grown to consider the field of persuasive technology as my research home, and persuasion as the lens through which I explore and understand user’s interaction with digital media. To me, *home* refers to the place where I know my way around, and find myself able to refuel before venturing out on yet another adventure. Such has been the case in this project where I recurrently found myself looking towards the persuasive technology literature, when struggling to tie together loose ends.

I approached the project with a curiosity towards exploring the notion of persuasive designs more stringently through the lens of the well-established field of learning. Upon realising that I was embarking into a cross-field which had been only scarcely approached by others, curiosity was supplemented with excitement as well as humility. I have been very much aware that so very many things can go wrong, when trying to do something that very few people have done before me.

The spark which initiated the actual process, and which has kept me motivated during the past four years, was the frustration I experienced when I found myself unable to clearly state the claim of persuasive design in relation to learning. Too often, I found myself trying to explain to learning experts that persuasive technologies were defined by being designed with the intent to change the user’s attitude and or behaviour,

only to receive the response that this had been the goal of learning for decades. Frustration only increased as it came to my attention that the claim of persuasive technologies was also being challenged in relation to other domains, such as information architecture and digital dissemination of cultural heritage. It is however important to note that frustration in my case is a positive feature, something which intrigues me and keeps me on my toes.

My research process has been driven by a more distinct focus on exploring the following research questions:

- What defines persuasive design as an approach to behaviour design, which is applicable both in theory and in practice?
- What defines a persuasive learning design and in what ways do learning facilitate an applicable definition of persuasive design?
- How can different perspectives of persuasive technology and persuasive design be applied in the development of persuasive learning designs?
- Is it possible to develop a methodological approach to persuasive design, which bridges between system-oriented design features and user-centred perspectives – thus considering both the wider and the narrow perspective of Kairos is acknowledged in the design?

In this thesis I have presented and discussed the theoretical perspectives which in my perception contribute significantly to the understanding of persuasion within the community, and also to what I refer to as a wider and more nuanced understanding of persuasive design. Based on indications from the pilot study conducted in the EuroPLOT project, as well as the literature study presented in Chapter 3, and with particular attention directed towards the rhetorical notion of Kairos, I argue that:

- Persuasive design distinguishes itself from other similar approaches to behaviour design, by acknowledging that continuous change is a process, and by distinctly encompassing ethical considerations, not only with regards to the intended outcome of the design but also the transparency by which the intent is mediated.
- Persuasive design, should not be considered an autonomous design approach, but rather a meta-perspective which may be applied to more established design fields and contribute to reflections regarding establishing an appropriate balance between the technology and the intended use context.

- The intent of persuasive technologies is not simply for the designer to change the user's attitude or behaviour, but rather to facilitate such a change, based on the mutual understanding of the context, established in collaboration between the designer and persuadee.

By this I recognise and consider the perspectives already acknowledged within the persuasive technology community, but strive towards a conceptualisation which enables persuasive features to be identifiable in other more established research and design areas.

The theoretical framework was subsequently applied in practice, as I continued my exploration of the cross field between persuasion and learning, in collaboration with the Danish army. Through the different phases of the design based research process, I have discussed and exemplified the potential and implications of applying persuasive design in learning, as well as clarifying how theories of learning and knowledge processing may constitute a significant contribution to the field of persuasive design. Through the process of designing, implementing and refining a persuasive learning design for conscripts in the Danish army, I have exemplified and discussed how different features and perspectives from the persuasive technology field, may be implemented into the design, yet in consideration of the intended use context.

From the combination of theoretical and empirical studies, I argue that the role of persuasive design in relation to learning, is not to improve the learning process, but rather to motivate and engage the students, so that they become more motivated to participate in the learning process. As such, persuasive learning designs may be defined as designs for learning designed with the distinct intent to motivate the students interest in a given subject.

Moreover, I argue that when considering the optimal outcome of any persuasive design the construction of a continuous behaviour change, achieved through a transparent design, learning may potentially be a requisite to the persuasive process. Continuous behaviour change springs from an attitude change within the user, which requires the user to process new insights. As such, theories of learning and knowledge processing holds much potential with regards to extending the theoretical underpinning of the persuasive design field.

From the literature review I identified that *Health* and *Sustainability* constitute the predominant application domains within the persuasive technology field. Common for these domains, is a need for continuous behaviour change, rather than momentary influence. Users must remember to exercise or take medicine, even when the technology does not

remind them, and waste must be managed appropriately even when there is little or no guidance provided.

In my perception, the prevalence of the health and sustainability domains, indicate that my understanding of persuasive design does not contradict the general understanding within the field. Hence, the contribution of my research is a clarification of some of the characteristics of persuasive design which comprises the unique claim of the field. Additionally, I find that these characteristics supports my claim that persuasive design holds particular potential in relation to the sustainability domain, compared to other approaches to behaviour design.

Finally, based on my theoretical underpinning, my practical experiences from the DBR process as well as insightful evaluation feedback from the design group, I have presented the initial steps towards a methodological framework for persuasive designs, which I refer to as EDIE. The framework seeks to facilitate the bridge between user-centred and system-oriented approaches to design, thus encompassing the multispatial dimensions of Kairos. More distinctly, the bridge is established by applying ethics constructively throughout all phases of the design process. Although the framework remains work in progress and lacks empirical testing, EDIE stands out by being based upon empirical research, and comprises the outcome of a substantial collaborative effort. Although the framework requires more research as well as empirical testing, I argue that it holds potential with regards to applicability for both persuasive technology experts and non-experts.

Through this project I argue to have made the following contributions to the persuasive technology field:

- By combining an extensive literature review with empirical research I expand the theoretical foundation of persuasive design from its existing basis in social psychology, rhetoric and interactive systems design, to also include theories of learning and knowledge processing.
- With my distinction between persuasive design and persuasive technology, I provide a wide definition of persuasive design, which not only enables practitioners to establish the claim of persuasive design in relation to other more established research field such as learning – it furthermore distinguishes persuasive design from other similar approaches to behaviour design, such as nudging.
- I have addressed the lack of ethical perspectives within the persuasive technology field, by exemplifying how ethics may be considered constructively throughout the design process.

Through my theoretical discussions as well as my practical exemplifications I have elucidated both how persuasive design in general may contribute to the development of learning designs in complex organizations, and also how distinct activities during the design process, may significantly influence the design solution. I have exemplified how acknowledged persuasive technology methods and features may be applied in unconventional ways, and thereby facilitate non-experts to participate in the design process. I have shown how context matters not only with regard to implementation of persuasive design solutions, but also in relation to participatory design activities, where the location has been argued to significantly influence the collaborative process. Finally, through my empirical research I have established that the potential of participatory design in relation to persuasive technologies, extends far beyond considerations of user values and ethics, and into the very basics of persuasion – the influencing of the user's attitude towards a given subject.

From the above, I conclude that my research has moved the notion of persuasive design towards a definition which is more widely applicable, and which enables persuasive features to be identified when applied in more established research areas. I have extended the theoretical underpinning of the persuasive design field and I have conceptualised a methodological approach to persuasive design, which more elaborately considers the different dimensions of Kairos.

REFERENCES

- Albrechtslund, A. (2007). Ethics and Technology Design. *Ethics and Information Technology*, 9(1), 63-72.
- Albrechtslund, A. (2008). *In the Eyes of the Beholder*. (PhD PhD), Aalborg University, Aalborg.
- Amiel, T., & Reeves, T. C. (2008). Design Based Research and Educational Technology: Rethinking Technology and the Research Agenda. *Educational Technology and Society*, 11, 29-40.
- Andersen, S. (2003). *Som dig selv, en indføring i etik*: Århus Universitetsforlag.
- Andersen, T., & Shattuck, J. (2012). Design Based Research - A Decade of Progress in Education Research? *Educational Researcher*, 41, 16-25.
- Ashworth, P., & Lucas, U. (2000). Achieving Empathy and Engagement: A practical approach to the design, conduct and reporting of phenomenographic research. *Studies in Higher Education*, 25(3), 295-308.
- Atkinson, B. M. C. (2006). *Captology: A Critical review*. Paper presented at the Persuasive Technology 2006.
- Barab, S., & Squire, K. (2004). Design-Based Research: Putting a State in the Ground. *The Journal of The Learning Sciences*, 1-14.
- Beetham, H., & Sharpe, R. (2007). *Rethinking Pedagogy for a digital age*: Routledge.
- Behringer, R. (2010). EuroPLOT Project Website - <http://www.eplot.eu/>.
- Benedikt, A. F. (2002). On Doing the Right Thing at the Right Time. In P. Sipiora & J. S. Baumlin (Eds.), *Rhetoric and Kairos, Essays in History, Theory and Praxis*. Albany: State University of New York Press.
- Berdichevsky, D., & Neuenschwander, E. (1999). Towards an ethics of persuasive technology. *Communications of the ACM*, 43, 51-58.
- Biggs, J., & Tang, C. (2007). *Teaching for Quality Learning at University* (3rd ed.): Society for Research into Higher Education & Open University Press.
- Brown, A. L. (1992). Design experiments: Theoretical and methodological challenges in creating complex interventions in classroom settings. *The Journal of The Learning Sciences*, 2, 141-178.
- Bødker, S. (1996). Creating conditions for participation: conflicts and resources in systems design. *Human Computer Interaction*, 11.
- Christensen, O., Gynther, K., & Petersen, T. B. (2012). Design Based Research - en introduction til en forskningsmetode i udvikling af nye E-læringskoncepter og didaktisk design medieret af digitale teknologier. *Læring og Medier*, 9.
- Collective, D. B. R. (2003). Design Based Research: An emerging paradigm for educational inquiry. *Educational Researcher*, 32, 5-8.
- Collins, A. (1992). Toward a design science of education. In E. Scanlon & T. O'Shea (Eds.), *New Directions in Educational technology*. New York: Springer-Verlag.
- Creswell, J. W. (2014). *Research Design, Qualitative, Quantitative, and Mixed Methods Approaches* (Fourth Edition ed.): SAGE.

- Davis, J. (2008). *Towards Participatory Design of Ambient Persuasive Technology*. Paper presented at the Pervasive 2008 Workshop Preceedings, Sydney, Australia.
- Davis, J. (2009). *Design methods for ethical persuasive computing*. Paper presented at the Proceedings of the 4th International Conference on Persuasive Technology, Claremont, California.
- Davis, J. (2010). Generating Directions for Persuasive Technology Design with the Inspiration Card Workshop. In T. a. P. H. a. H. O.-K. Ploug (Ed.), *Persuasive Technology* (Vol. 6137, pp. 262-273): Springer Berlin / Heidelberg.
- Ehninger, D. (1972). *Contemporary Rhetoric: a reader's coursebook.*: Glenview, IL., Scott, Foresman and Company.
- F.B.E. (2012). Grønne Etablissementer.
- Fogg, B. (2003). *Persuasive Technology, Using Computers to change what we Think and Do*: Morgan Kaufmann Publishers.
- Fogg, B. (2007). The Future of Persuasion is Mobile. In B. Fogg & D. Eckles (Eds.), *Mobile Persuasion, 20 Perspectives on the Future of Behavior Change*: Stanford Captology Media.
- Fogg, B. (2009a). *A behaviour model for persuasive design*. Paper presented at the Persuasive 09.
- Fogg, B. (2009b). *Creating persuasive technologies: an eight step design process*. Paper presented at the Persuasive 09.
- Fogg, B. (2010). *The Behavior Grid: 35 ways behaviour can change*. Paper presented at the Persuasive 2010, Copenhagen.
- Fogg, B., & Eckles, D. (2007). *Mobile Persuasion - 20 Perspectives of the Future of Behavior Change*: Persuasive Technology Lab, Stanford University.
- Forsvarsakademiet. (2014). Miljøkørekortet.
- Friedman, B., & Kahn, P. H. (2003). *Human values, ethics and design*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Glasemann, M., Kanstrup, A. M., & Ryberg, T. (2010). *Making chocolate-covered broccoli: designing a mobile learning game about food for young people with diabetes*. Paper presented at the DIS'10 Proceedings of the 8th ACM Conference on Designing Interactive Systems, New York.
- Glud, L. N., & Jespersen, J., Leth (2008). Conceptual analysis of Kairos for Location-based mobile devices. *University of Oulu. Department of Information Processing Science. Series A, Research Papers*, 17-21.
- Gram-Hansen, L. B. (2009). *Geocaching in a persuasive perspective*. Paper presented at the The 4th Conference on Persuasive Technology, Claremont, CA.
- Gram-Hansen, L. B., Gram-Hansen, S. B. (2013). Fra Geocaching til Persuasiv Læring. *Munkiana*(52), 16.
- Gram-Hansen, S., & Gram-Hansen, L. (2013). *On the role of ethics in Persuasive Design*. Paper presented at the Ethicomp 2013, Kolding.
- Gram-Hansen, S., & Ryberg, T. (2015). *Attention – Influencing Communities of Practice with Persuasive Learning Designs*. Paper presented at the 10th International Conference, PERSUASIVE 2015, Chicago.

- Gram-Hansen, S. B. (2009). *Towards an Approach to Ethics and HCI Development, based on Løgstrup's Ideas*. Paper presented at the Interact, Uppsala.
- Gram-Hansen, S. B. (2010). *Persuasive Everywhere - Possibilities and Limitations*. Paper presented at the WMSCI, Orlando, Florida.
- Gram-Hansen, S. B. (2012). *Deliverables Report D.3.3, Persuasive Learning Designs*. Retrieved from
- Gram-Hansen, S. B. (2013). *Fremtidens Grønne Kaserne - Krav, Behov og Visioner*. Retrieved from Danish Military:
- Gram-Hansen, S. B. (2016). *The EDIE method - towards an approach to collaboration based persuasive design*. Paper presented at the Persuasive 2016, Salzburg.
- Gram-Hansen, S. B., & Ryberg, T. (2013). Persuasion, Learning and Context Adaptation. *Special Issue of the International Journal on Conceptual Structures and Smart Applications*.
- Gram-Hansen, S. B., & Ryberg, T. (2015). *From participatory Design and Ontological Ethics, Towards an approach to Constructive Ethics*. Paper presented at the Ethicomp 2015, Leicester.
- Gram-Hansen, S. B., Schärfe, H., & Dinesen, J. V. (2012). *Plotting to Persuade - Exploring the theoretical cross field between Persuasion and Learning*. Paper presented at the Persuasive Technology 2012, Sweden.
- Halskov, K., & Dalsgaard, P. (2006). *Inspiration card workshops*. Paper presented at the Proceedings of the 6th conference on Designing Interactive systems, University Park, PA, USA.
- Ham, J. a. C. M. (2010). *Ambient Persuasive Technology Needs Little Cognitive Effort: The Differential Effects of Cognitive Load on Lighting Feedback versus Factual Feedback* Paper presented at the Persuasive 2010, Copenhagen.
- Hansen, J. B. (2009). Den rette tale på det rette tidspunkt. *RetorikMagasinet*, 74.
- Hansen, P. G., & Jespersen, A. M. (2013). Nudge and the Manipulation of Choice: A Framework for the Responsible Use of the Nudge Approach to Behaviour Change in Public Policy. *European Journal of Risk Regulation : EJRR*, 4(1), 3-28.
- Hasle, P., & Christensen, A. K. K. (2007). *Classical Rhetoric and a Limit to Persuasion*. Paper presented at the Persuasive Technology, Palo Alto.
- Illeris, K. (2007). *How We Learn - Learning and non-learning in school and beyond*: Routledge.
- Iversen, S. D., & Pertou, M. (2008). *Categorization as persuasion - Considering the nature of the mind*. Paper presented at the Persuasive Technology, Finland.
- John, P., Cotterill, S., & Richardson, L. (2011). *Nudge, Nudge, Think, Think*. Huntingdon, GBR: Bloomsbury Academic.
- Jungk, R. a. N. M. (1987). *Future Workshops: How to Create Desirable Futures*. London: Institute for Social Interventions.
- Kahneman, D. (2011). *Thinking fast and slow*. New York: Farrar, Straus and Giroux.

- Kinneavy, J. L. (2002). Kairos in Classical and Modern Rhetorical Theory. In P. Sipiorea & J. S. Baumlín (Eds.), *Rhetoric and Kairos, Essays in History, Theory and Practice*: State University of New York Press.
- Lindhardt, J. (2003). *Retorik*: Rosinante.
- Lockton, D., Harrison, D., & Stanton, N. (2008). *Persuasive Technology in a Wider Context* Paper presented at the Persuasive 2008, Oulu Finland.
- Lockton, D., Harrison, D., & Stanton, N. A. (2010). The Design with Intent Method: A design tool for influencing user behaviour. *Applied Ergonomics*, 41(3), 382-392. doi:10.1016/j.apergo.2009.09.001
- Lucero, A., Zuloaga, R., Mota, S., & Muñoz, F. (2006). Persuasive Technologies in Education: Improving Motivation to Read and Write for Children. In W. A. Ijsselstein, Y. A. W. Kort, C. Midden, B. Eggen, & E. Hoven (Eds.), *Persuasive Technology: First International Conference on Persuasive Technology for Human Well-Being, PERSUASIVE 2006, Eindhoven, The Netherlands, May 18-19, 2006. Proceedings* (pp. 142-153). Berlin, Heidelberg: Springer Berlin Heidelberg.
- Lykke, M. (2009). *Persuasive design strategies: means to improve the use of information organisation and search features in web site information architecture?* Paper presented at the ASIST Special Interest Group on Classification Research 20th Workshop, Vancouver.
- Løgstrup, K. E. (1997). *The Ethical Demand*: University of Notre Dame Press.
- Miller, G. R. (2002). On Being Persuaded, Some Basic Distinctions. In J. P. Dillard & M. Pfau (Eds.), *The Persuasion Handbook, Developments in Theory and Practice*. London: Sage Publications.
- Ministry of Defence, D. (2011). *Forsvarsministeriets koncernfælles strategi for informations- og kommunikationsteknologi 2011 - 2014*. Retrieved from
- Ministry of Defence, D. (2012a). *Forsvarets Klima og Energi strategi*.
- Ministry of Defence, D. (2012b). *Forsvarsministeriets miljø- og naturstrategi 2012-2015*. Retrieved from
- Ministry of Defence, D. (2013). *Forsvarets og Hjemmeværnets Kompetenceudviklingsstrategi*. Retrieved from
- Müller, L., Rivera-Pelayo, V., & Heuer, S. (2012). Persuasion and Reflective Learning: Closing the Feedback Loop. In M. Bang & E. L. Ragnemalm (Eds.), *Persuasive Technology. Design for Health and Safety: 7th International Conference, PERSUASIVE 2012, Linköping, Sweden, June 6-8, 2012. Proceedings* (pp. 133-144). Berlin, Heidelberg: Springer Berlin Heidelberg.
- Nicklas, D., Pfisterer, B., & Mitschang, B. (2001). *Towards Location-based Games*.
- Nielsen, J., & Molich, R. (1990). *Heuristic evaluation of user interfaces*. Paper presented at the CHI'90, Seattle.
- Oinas-Kukkonen, H., & Harjuma, M. (2008). *A systematic Framework for Designing and Evaluating Persuasive Systems*. Paper presented at the Persuasive 2008, Finland.

- Oinas-Kukkonen, H., & Harjumaa, M. (2009). Persuasive Systems Design: Key Issues, Process Model, and System Features. *Communications of the Association for Information Systems*, 24.
- Oinas-Kukkonen, H., Harjumaa, M. (2008). *Towards Deeper Understanding of Persuasion in Software and Information Systems*. Paper presented at the Advances in Computer-Human Interaction, 2008 First International Conference on.
- Operate. (2012). *Målgruppeanalyse og Segmentering*. Retrieved from
- Papanek, V. (1985). *Design for the Real World - Human ecology and Social Change*: Thames & Hudson.
- Pertou, M., & Iversen, S. D. (2009). Persuasive Design i Retorisk Perspektiv. *retorica Scandinavia*, 46/50, 15.
- Piaget, J. (1999). *The psychology of intelligence*. London, GBR: Routledge.
- Preece, J., Rogers, Y., & Sharp, H. (2007). *Interaction Design - Beyond Human Computer Interaction*: John Wiley & Sons.
- Redström, J. (2006). *Persuasive Design: Fringes and Foundations*. Paper presented at the Persuasive Technology 2006, Eindhoven.
- Reeves, T. C. (2006). *Design research from a technology perspective*. London: Routledge.
- Shields, P. M., & Rangarajan, N. (2013). *A Playbook for Research Methods*: New Forum Press.
- Simonsen, J., & Robertson, T. (2012). *Routledge International Handbook of Participatory Design*: Routledge.
- Sipiora, P. (2002). Introduction, The Ancient Concept of Kairos. In P. Sipiora & J. S. Baumlin (Eds.), *Rhetoric and Kairos, Essays in History, Theory and Praxis*. Albany: State University of New York Press.
- Spahn, A. (2011). And Lead us (Not) into persuasion...? Persuasive technology and the Ethics of Communication. *Science and Engineering ethics*, 18(4).
- Thaler, R., & Sunstein, C. R. (2009). *Nudge: Improving decisions about health, wealth, and happiness* (Rev. and expanded ed. ed.). London, GBR: Penguin Books.
- Tolkien, J. R. R. (1937). *The Hobbit*: George Allen & Unwin.
- Torning, K., & Oinas-Kukkonen, H. (2009). *Persuasive system design: state of the art and future directions*. Paper presented at the Proceedings of the 4th International Conference on Persuasive Technology, Claremont, Californien.
- Weinmann, M., Schneider, C., & Vom Brocke, J. (2015). Digital Nudging. *Social Science Research Network*.
- Wenger, E. (1998). *Communities of Practice - Learning, Meaning and Identity*: Cambridge University Press.
- Zander, P.-O. (2010). *From Workshops to Walkshops: Evaluating Mobile Location-Based Applications in Realistic Settings*. Paper presented at the Proceedings of the 1st International Workshop on Observing the Mobile User Experience, Reykjavik.

Aagaard, M. a. P., Øhrstrøm and Lars, Møltzen. (2008). *It might be Kairos*. Paper presented at the Persuasive 08, Oulu Finland.

Appendix A.

Workshop I

The first workshop – and thereby my first experience with collaborating with Danish Defence Estate and Infrastructure Organisation (DDEIO), was a full day activity held at Hjørring Kaserne in Northern Jutland on March 20th 2012.

As the workshop was conducted prior to my formalized collaboration with the DDEIO, I did not approach it with a research mindset or agenda. However, when the collaboration was shortly after arranged, I recognize this workshop as my first impressions of the challenges related to behaviour change for sustainability in the Danish Military

For referencing, this appendix includes:

- Summary of my notes from the day
- Photo documentation of the activities
- My presentation slides

SUMMARY OF NOTES

Workshop aim:

The workshop was arranged as the DDEIO were experiencing difficulty in communicating their needs to the graphic design company Det Nye Sort. In spite of positive meetings, the design solutions proposed by Det Nye Sort, failed to meet the expectations of the DDEIO – not due to a lack of creativity or competence, but due to lack of context understanding.

Moreover, the DDEIO employees responsible for climate communication, had a wish for inspiration in relation to their work. Not all employees have an educational background in communication, but are placed in the department, due to knowledge on the climate subject.

Participants

In total, the workshop was joined by 14 participants and run by 2 facilitators (myself and Lasse Gram-Hansen) The list of participants included representatives from DDEIO, Graphical design company Det Nye Sort, and representatives from each of the three military services; army, navy and air command. Service representatives were all high rank officers with administrative responsibilities.

Location

Hjørring Kaserne (Military base), Northern Jutland, Denmark

Workshop Agenda

- Welcome – Thomas Klingemann. DDEIO
- Introduction to Persuasive Design – Sandra Gram-Hansen, AAU
- Coffee Break
- Group Work
- Recapitulation
- Closing

Significant insights

While representatives from DDEIO and Det Nye Sort, all are civilian, and dress as such, the representatives from the different military services, all wore uniform for the workshop. As no dress code was assigned for the activities, uniforms were not mandatory, but as the workshop took place at Hjørring Kaserne, the choice to wear uniform may have based on the location.

During the group activities, the participants were asked to design (with Lego and play dough) solutions which would facilitate energy saving in office environments. During this phase of the workshop, it was almost impossible for the military service participants, to disregard the financial and administrative challenges related to implementation of such solutions.

Even though it was clarified that the goal of the workshop was to facilitate dialogue and establish a deeper understanding of the context, the session led to heated discussions, during which the military service participants more than once referred to their military ranks as support of their arguments. The immediate strong focus on military rank and strong focus, and the slight tendency to disregard opinions and perspectives raised by civilian participants, made facilitation rather difficult.

PHOTO OVERVIEW



Shortly after arrival and welcoming to the workshop, I provided a brief introduction to persuasive design and the agenda of the day



The goal of the persuasive design introduction was to provide all participants with inspiration for the workshop, including terms which might facilitate the workshop, and concepts such as Kairos, which might be relevant in the future



Workshop participants were eager to engage in discussions during my presentation



After a brief coffee break, participants split into 2 groups. Both groups were a mix of participants, from the military services, DDEIO and Det Nye Sort



Discussions and productivity was facilitated with inspiration cards, play dough and LEGO. Each group was asked to produce examples of devices which would decrease the energy usage in office buildings.



Figure 33 - As the groups were re-joined, they were asked to present the main topics of their discussions, along with their suggestions for persuasive technologies for energy sustainability in the Danish Military Defence

PRESENTATION SLIDES

At forme en kontekst
-En introduktion til Persuasive Design

Om mig

- » **Navn:**
 - » Sandra Burri Gram-Hansen
- » **Nuværende stilling:**
 - » Teaching Assistant Professor / Studieadjunkt, Aalborg Universitet
- » **Uddannelsesmæssig baggrund:**
 - » MSc Information Science and Information Architecture
- » **Nøgleord:**
 - » Persuasive design, Etik, Kairos, Mobile Persuasion, Everware, Digital læring

E-PLOT

- Udforske krydsfeltet mellem persuasion og didaktik, og krydsfeltet mellem persuasive teknologier og læringsobjekter
- Videreudvikle to eksisterende læringsteknologier med udgangspunkt i persuasive design.
- Skabe interaktive læringsteknologier der er motiverende og engagerende.

EuroPLOT Konsortiet

2 Læringsteknologier:

- 1. CLOMaker
- 2. 3ET

4 Cases:

1. Kaj Munk
2. Sproglæring (Hebræisk)
3. Risiko-vurdering ved blanding af kemikalier
4. Fjernundervisning i brugen af IT systemer i erhvervslivet

Partners: University of Hradec Králové, DHI, OPAU UNIVERSITY, AALBORG UNIVERSITY

Etablering af et fælles sprog...



... Og en gensidig forståelse!

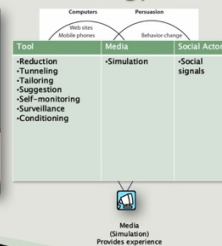
Dagens program

- › Introduktion til Persuasive Design
- › Workshop
- › Præsentation/Opsamling

Persuasive Design



Persuasive Technology



En Persuasiv Teknologi er...

"... enhver form for interaktiv computerteknologi, designet med henblik på at ændre menneskers holdninger og/eller adfærd (uden brug af snyd, bedrag eller manipulation)"



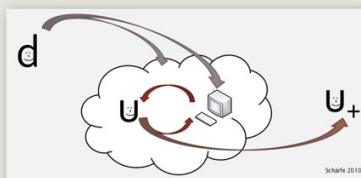
Teknologier i rette kontekst...



Design med et klart budskab



Design med intentioner...

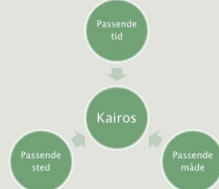


Kairos i græsk mytologi

- › Søn af Zeus og Gud for det gunstige øjeblik
- › Konstant i bevægelse
- › Fanges ved et greb i pandelokken
- › Man må planlægge og afvente hans ankomst



Kairos som retorisk koncept



14

Kairos

Filosofisk • Kontekst

Praktisk • Timing

15

Persuasive Design i praksis



Persuasive Design handler om...

- › At forme en kontekst og at forme et persuasivt initiativ i den kontekst!
- › At lade konteksten formidle den ønskede adfærd!
- › At gøre det nemt for "brugerne" at udføre den ønskede adfærd!



16

Workshop



Formålet med dagens workshop

- › At etablere et fælles sprog – og et gensidigt ansvar
 - › Alle I, der deltager i dag, er her, fordi I er eksperter inden for lige netop jeres område
- › At skabe fundamentet for det videre kampagnearbejde i Energi i Forsvaret
 - › Målttede kampagner sparer alles tid



Første skridt:

- › Lav et navneskilt – brug kun dit fornavn ;-)

Dagens opgave

- › Udarbejd en poster, der fortæller, hvor I som gruppe har valgt at fokusere jeres indsats
- › Udarbejd med udgangspunkt i jeres fokusområde en række eksempler på, hvordan man kan understøtte den persuasive intention i den kontekst, I ønsker at forme
- › Husk at det handler om at skabe persuasive initiativer, der er nærværende og passende for jeres kontekst!

Gruppeinddeling

- | | |
|-----------------------------|----------------------------|
| › Klaus Kaalund Billenstein | › Kim Grünberger |
| › Kenneth Nielsen | › Dennis Knudsen |
| › Gitte Feltsted | › Britta Schade |
| › Marianne Bue Lønskov | › Thomas Troels Klingemann |
| › Thilde Møller Larsen | › Inge Haugaard Nielsen |
| › Torben Ellegaard | › Nicholas Tougaard |
| › Stefan Thaarup | › Mikkel Jørgensen |

Gruppe 1

Gruppe 2

Appendix B.

Field Observations & In-Situ interviews

Over the duration of my collaboration with DDEIO, a vast amount of time has been spent at different army establishments in Denmark – primarily Aalborg Kaserne in northern Jutland, and Almegaard Kaserne on the island of Bornholm.

In the acknowledgement that my experiences at these army establishments, my observations and my conversations with different army employees, greatly influence not only my interpretation of data, but also my evaluation of the system, this appendix presents general images of the two establishments, along with an outline of some of my more significant encounters. Out of curtesy to the army employees who have contributed with their insights and opinions, this part of the appendix has been anonymised.

For referencing, this appendix includes:

- Meaning condensed field notes and transcriptions of conversations with military employees, with particular significance

SEMI-STRUCTURED INTERVIEW WITH OPERATION AND EDUCATION OFFICER AT AALBORG KASERNE

As part of my general introduction to the different army segments, and to the physical establishments at Aalborg Kaserne in Northern Jutland, I arranged to meet with Officer H, who at the time held responsibilities as an army instructor. Officer H and I initially became acquainted 20 years ago, when we both were involved in managing boy scouts. Consequently, our pre-meeting written correspondence was informal, and my expectation was that the meeting would be conducted in a similar light hearted manner.

Excerpt of pre-meeting correspondence, 19.03.2014 (translated from Danish)

Sandra: *Hi, I hope all is well with you. Are you by any chance still working at Aalborg Kaserne, and if yes, might I ask what your position is? Best, Sandra*

Officer H: *Hi Sandra, I am very well thanks, busy moving into a new house. I still work at Aalborg Kaserne and I work as an operations and*

education officer in the battalion which works with conscripts and all medics... Basically that means sitting in an office and making sure that all units have the directives and options they need to educate and train ;) – Why?

Sandra: I got to think of you because I just spent the whole day in building 22 with Thilde from DDEIO. I am involved in developing campaign material and learning designs which will motivate you all to save energy ;-) What we are very much focused on, is designing solution which will not interfere too much with everything else you are doing, and which will not force you to spend a lot of extra hours on the subject. – And it struck me that you might be able to share some insights regarding daily routines and current learning practice.

Officer H: Count me in. Suggest a few dates and I will try to make it work. – If nothing more, I can share my own thoughts, and point you in the direction of who else to talk to. And in return, if I'm lucky, I might achieve that someone will adjust the crappy computer in my office, which is currently insisting that my radiator must be turned on, unless the temperature in my office is 45 degrees, or the window is open.

Sandra: I am back at Aalborg Kaserne all day on Tuesday, so any chance of meeting you sometime during the day will be fabulous. We are doing all our preliminary research at the moment, so personal opinions and experiences are more than welcome – And in return, I will bring my own toolbox and fix your radiator.

Officer H: I already fixed it Infantry style – by screwing of the switch by the window. Its turned off now. I will check my schedule for Tuesday, but it should be doable.

Sandra: Amazing, I will be there somewhere

Summary of meeting with Officer H, based on field notes

The meeting with Officer H took place in the building in which he works, where he had arranged for us to have a meeting room available.

Before going to the meeting room, he asked Thilde Møller Larsen to go with him to his office, where he showed her the removed thermostat and explained that he had removed the switch as it did not work – he referred to this as an infantry style repair.

In the meeting room, I explained my reason for asking for the meeting, as well as my role in relation with DDEIO. Initially, officer H, Thilde Møller Larsen and I were all sat around the meeting table, however, as the conversation progressed, Officer H moved to stand by the whiteboard, and occasionally visualise his points for us. In my experience of the situation, Officer H indicated a strong need to be in control of the conversation, and to place himself in a position of power where he could educate both myself and Thilde Møller Larsen.

Officer H explained that he and his colleagues are challenged by the extensive amount of information, forwarded to them from various government agencies. He stressed that the priority for him was to ensure that the Danish soldiers were best possibly prepared for international missions, and that environmental issues were not something he considered a top priority.

He explained that it was a significant problem that the DDEIO did in his opinion not follow the chain of command when they disseminate information into the organization. He visualized his understanding on the whiteboard, and explained that in his position, he is not able to respond to all information forwarded to him, and consequently, he only prioritised the subjects which have been forwarded directly from his superior officer. – To him, the reason why information from the DDEIO was not given any consideration, was that too many irrelevant campaigns were sent out, and it was not endorsed by his superior officers.

To exemplify sustainability related issues which the DDEIO had identified in relation to office working military employees, Thilde explained that computers are seldom shut down or restarted. There is a tendency amongst many of the different office segments, to simply leave computers on standby, when leaving work – not only over night, but also in weekends, holidays or during long term leave. Military computers are updated overnight and require regular restarts for the new updates to be implemented, and a general system overview had shown that a vast number of computers had not been updated for months – some even for years. The problem was identified not only as unnecessary energy waste, but also a security breach, as the missing updates imposed a vulnerability to the systems.

Officer H explained that he was in fact one of the employees who deliberately chose not to switch off his computer when leaving work. He explained that first of all, the computers used in the military were so outdated that restarting them was highly time consuming – restarting the

system could take up to 30 minutes, and secondly, that he had experienced personally that 6 months' work had been lost during a systems update.

Moreover, Officer H explained that his training as a military officer, had taught him the importance of trust and division of responsibility, and argued that DDEIO should acknowledge that the army officers were more than capable of evaluating the DDEIO material, and then decide what should be presented to the soldiers in training and how it should be done. This particular point led to a discussion between Officer H and Thilde Møller Larsen, as she argued that firstly his understanding of the chain of commands was incorrect, and secondly that there was nothing in the DDEIO material which was up for interpretation – If measurements indicated that soldiers were spending too much water in the barracks, they were not presented with a choice but with a distinct order to cut back on water consumption.

Officer H did not acknowledge the counter arguments presented by Thilde Møller Larsen, but instead stressed even further that the DDEIO did not have the sufficient qualifications to communicate directly to the army employees. As I was also present he extended this argument by stating that *“Besides, there isn't a professor in that university you come from, who is as capable at communicating as an officer in the Danish army”*

Semi-Structured interview with Corporal F. from the military distribution and depot

Following our meeting with Officer H., Thilde and I proceeded on to the military distribution and depot, where I was introduced to Corporal F. The military distribution and depot was physically located 100m down the road from Officer H's establishment building. The depot manages all army material, such as uniforms and supplies. During my visit to the depot, I was given tour of the location, while Corporal F. explained

Summary of meeting with Corporal F, based on field notes

Having been informed about my research, and the reason for my enquiries, Corporal F. took the initiative to show me around the depot, and tell me about his work practice. The atmosphere of the visit was positive and humorous and included me trying out the new camouflage colours of the Danish army.

Corporal F. was visibly pleased by the opportunity to describe some of the initiatives he had taken with regards to sustainability and optimization of

work practices within the depot. Consequently, the majority of the conversation included topics with little direct relevance to my research.

Contrary to the attitude of Officer Holst, Corporal F. was highly positive towards the increased focus on sustainability within the Danish Defence Command. He argued that environmental protection is in fact one of the primary tasks of Defence Command Denmark, and that it should as such always have been given a much higher priority.

During the tour of the depot, we passed the depot computers, which were placed by the front desk. I noticed that both computers were on at the time, and took the opportunity to mention the issue regarding computers being left on standby over night to Corporal F.

Corporal F. appeared to be surprised to hear that this was an issue in other segments and explained that the system updates are a high priority in the depot. Not only due to the security risk, but also due to the fact that the updates also includes updated lists of inventory. Thus, if the computers in the depot are not restarted, Corporal F and his colleagues would not be able to manage the depot and provide the army employees with the required material. Consequently, computers were always switched off in the evening and restarted in the morning. It was the experience of Corporal F. that he could switch on computers, walk to the coffee machine to get coffee, and then be ready to work upon returning to the front desk.

As the conversation moved more towards the topic of sustainability, and waste management, Corporal F. took particular pride in showing me that the depot employees had on their own initiative applied for a paper press, which had been granted them. He explained that all material delivered to the depot arrives in large card board boxed. Prior to having the paper press installed, all the boxed had to be driven to the waste management transfer station, and due to the number of boxes, this was done on a daily basis. Transport was done by use of a fork lift truck – a vehicle with a high use of diesel and very low speed.

By having the paper press installed in the depot, boxes were now pressed immediately after arrival, and stacked in a corner. Transport to the waste management transfer station now only took place once a week. Thus, the paper press not only optimized the work practice of the depot, as far less time was spent transporting the boxes, but use of diesel was also decreased as all boxes could be transported at the same time, once they had been pressed.

Collaboration with Education and Training Sergeant M, Almegaard Kaserne, Bornholm

Both in the planning and during the iterations of testing Attention at Almegaard Kaserne, the design group collaborated closely with Educational Sergeant M. who was in command of the participating conscripts.

Collaboration was first initiated during a pre-test meeting held at Almegaard Kaserne. Besides from the design group, a master student intern and Sergeant M. the meeting was joined by the estate manager from Almegaard Kaserne, and the environment coordinator from DDEIO.

The aim of the meeting was to establish the potential of testing Attention at Almegaard Kaserne, and to gain more detailed insights regarding the accuracy of the learning material.

Significant insights:

Sergeant M. did initially appear sceptical yet intrigued by the new approach to environmental education. He provided significant insights regarding the complexity of the conscripts, explaining that while some are excellent learners on their way to university education, others have struggled to get through primary school. Some of the conscripts struggled with dyslexia. Consequently, Sergeant M recommended that the learning material was simplified significantly to meet the competence level of the conscripts.

Also attending the meeting was the environment coordinator from the DDEIO, who was able to confirm that the material corresponded to that included in the EDL. She also noted that there were actually some errors in the material, and concluded that the EDL would also need to undergo review. In order to ensure comparability between Attention and the EDL, it was decided not to change the learning material, for the first test, but to take the learners competence level into consideration during evaluation.

Sergeant M. was positive towards the notion of competition which was implemented in Attention. He commented that *“Conscripts like competition, they will compete in just about anything, just to win bragging rights”*.

On the first morning of the 3 test days, I was briefed by the officer in command, that the conscripts had spent the entire previous day marching in terrain. Thus, I was advised to provide them with regular breaks as they

were mentally and physically exhausted. In collaboration with the officer in command, it was decided that a general introduction would be given to all conscripts at the same time, and that a more detailed introduction would be given to the individual segments each day, as they were also presented with the introduction film.

In practice, this decision helped ensure a fair competition between the conscripts all were given equal prerequisites to do well in the Attention game. More importantly however, it enabled us to more distinctly consider that the DBR approach calls for several iterations of test and refinement. Even though the segments did not experience major differences between their tests, small refinements were made from day to day. E.g. the touch screens were moved to a more appropriate location, and small technical adjustments were made to the system.

Subsequent to the tests of Attention, an evaluation meeting was held with attendance of the design group, Sergeant M, and Estate Manager Jacobsen.

There was a noticeable change in attitude from both Sergeant M and the Estate manager, who both saw much potential in Attention. It was particularly noted that the system enabled scenario based learning to be facilitated by only one instructor, compared to the previously 4-5 instructors. Furthermore, Sergeant M. saw much potential in also teaching other subjects than waste management through the system. He suggested that it would be highly applicable for weapons education, were not all conscripts in a platoon could shoot at the same time, suggesting that those who were waiting for their turn, could train their theoretical knowledge through Attention.

Moreover, it was brought to our notice, that the learning design had received positive attention from other segments of the army. Amongst others, the home guard had asked if it was possible for them to try out the game as well. Hence it was noted that the tests conducted had not alone provided insights regarding the potential of the design, it had also sparked some interest amongst some of the segments who had otherwise been considered reluctant towards environmental education.

Appendix C.

Workshop II

The second workshop was a full day activity held at Aalborg University, e-Learning Lab, Design Lab, on September 24th 2013

The workshop was facilitated on behalf of DDEIO as part of project Green Army Barracks. Thus, the workshop was not designed specifically to provide insights for my own research. However, the activities and discussions during the event has provide many significant insights for my own work, both with regards to understanding the intended use context and with distinct requirements for the persuasive learning design.

For referencing, this appendix includes:

- Summary of my notes from the day
- Photo documentation of the activities
- My presentation slides

SUMMARY OF NOTES

Workshop aim:

A central part of Project Green Army Barracks was a competition for architects to design sustainable military establishments for the future. The winner of the competition would win the bid to design the actual Green Army Barrack for Aalborg Kaserne.

The aim of this workshop was to generate distinct requirements for the competing architects to take into consideration in their design solutions. The future military establishments must not only be energy and environmentally sustainable, they must also facilitate the practical needs of the military staff who work there.

In consideration of the competition, the workshop aimed to establish a mutual understanding of requirements amongst the participants, but suggested solutions where not put forward to the architects.

Participants

The workshop was joined by 11 high ranked officers, 3 authority representatives from the Danish Defence Command including

representatives from the Danish Special Forces, 1 representative from the Danish Ministry of Defence, and 6 high ranked employees from DDEIO.

In total, the workshop was joined by 21 participants and run by 2 facilitators (myself and Lasse Gram-Hansen)

Location

Design Lab, Aalborg University, Friis, Aalborg, Denmark

Workshop Agenda

- Welcome and introduction – Sandra Gram-Hansen - AAU
- Motivation and setting – Brigadier General Claus Uttrup
- Critique phase
- Lunch
- Idea phase
- Summary and closing

Significant insights

The workshop took place at Aalborg University, partly to facilitate the establishment of a mutual power balance between the participants and partly to facilitate creative thinking amongst the participants by placing them in an unfamiliar setting – and a modern learning environment.

No dress code was assigned for the activities, uniforms were not mandatory, as the workshop took place at Aalborg university, some participants had chosen not to wear uniform. It was noticeable that this made them uncomfortable, when they realised that the Brigadier General was also participating.

It had been a concern if the presence of the Brigadier General would have a negative impact on the collaboration between the participants. Fortunately, this was not the case, partly due to a splendid motivational talk by the general, in which he stressed the importance of everyone's input. It was however noted that in spite of a positive and creative atmosphere, the participants did not find themselves able to address the general by name.

The workshop combined individual activities and group activities, where participants were mixed in 3 groups, who then each collaborated in the different workshop activities.

During the workshop, the participants were asked to:

1. Individually describe what they believed to be the primary challenge of their daily work practice
2. Collaborately develop what was referred to as inspiration cards, with activities and facilities which were considered important to the daily practice on the army establishments
3. Design (with Crayons, Lego and play dough) prototypes of what the future green army barracks should look like.

The workshop was summed up by each group presenting their solution and explain what challenges the solution aimed at addressing. I subsequently summed up the insights gathered through the workshop, in an internal report for DDEIO, which also contained a list of requirements for project Green Army Barracks.

During the workshop, the following issues were brought up in discussion, and found to be particularly relevant also to my research.

Through the opening discussions and presentation of individual assignment solutions, there are massive fundamental difference between the different army establishments in Denmark. Some are already equipped with modern training and exercise facilities while others struggle to uphold their daily work practice in very old buildings.

Upon discussing the physical facilities of the military establishments, the current sleeping quarters were brought up as a subject. The brigadier general had in his introduction talk, noted that Project Green Army barracks was a high priority project, as the physical buildings and facilities of the establishments had not undergone the same transition and modernisation as e.g. the soldiers' equipment and weapons.

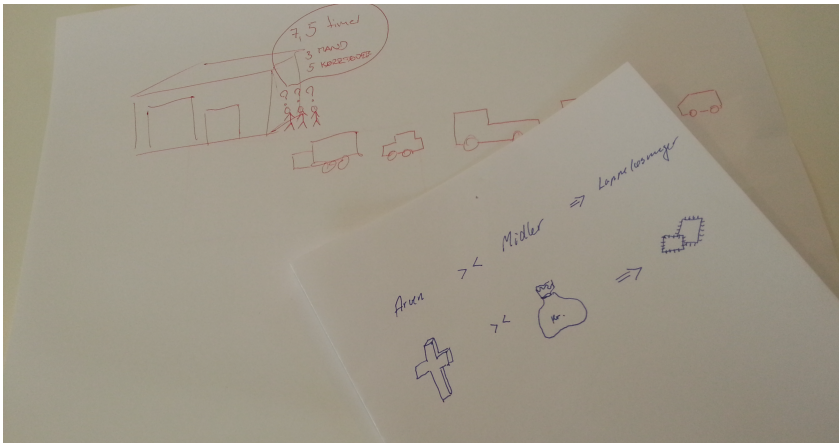
During the subsequent discussion it was suggested that the army would perhaps be a more popular educational institution, if conscripts and soldiers in training were offered study apartments on base, similar to students in dormitories. This was quickly rejected by one of the participating officers, who explained that living in primitive sleeping quarters and having no private life as such, is considered part of military training. If the soldiers are not able to adapt to this way of living when in Denmark, they will not be able to do so once they are sent on military missions in areas of conflict.

Furthermore, the current sleeping quarters force the soldiers to learn to collaborate with their segment, and to respect each other's differences.

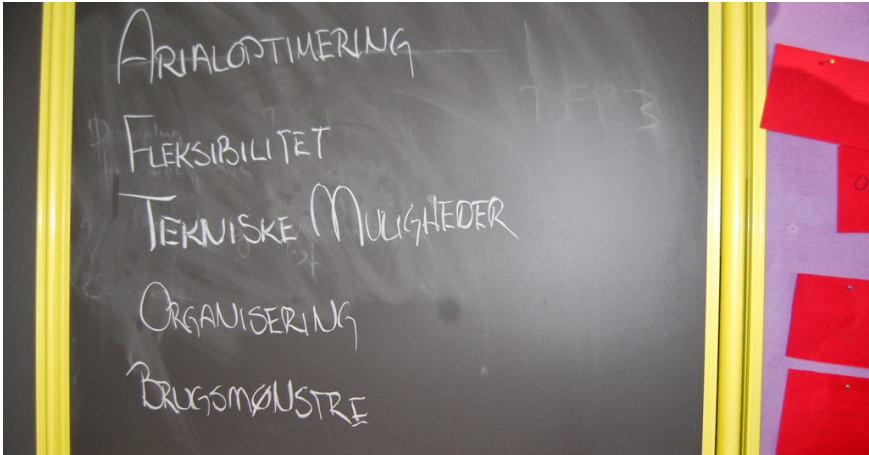
PHOTO OVERVIEW



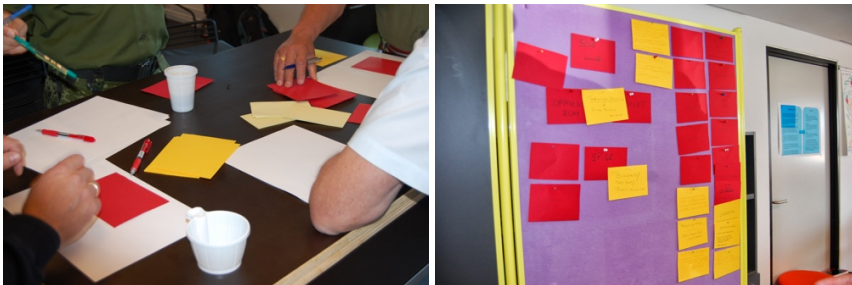
Workshop took place in eLL Design Lab, Aalborg University, Friis. Brigadier General Uttrup motivated the workshop with a talk about the transitions of the Danish Military through history.



Workshop participants were asked to individually visualise the primary challenges of their daily work practice. In this picture, a participant has visualized how the cultural heritage of the Danish defence Command, in combination with limited funds, too often lead to stop-gap solutions.



To ensure that the participants did not lose focus of the intended outcome of the workshop, 5 focus points had been predefined, for them to consider during the different creative activities. The 5 focus points were written on the blackboard



Collaborating in groups, the participants produced a number of red and yellow inspiration cards which were placed on the notice board as inspiration in the subsequent phases. Red cards indicated specific actions which should be possible to perform on base, e.g. sleep, eat, exercise etc. Yellow cards indicated facilities which should be available on all military bases e.g. Indoor training facilities, recreational areas, meeting rooms, auditoriums etc.

APPENDIX C.



Working in groups, the participants were asked to design prototypes of the future green army barracks, by use of Lego, Play Dough and Crayons. They were moreover invited to use the Design Lab Sandboxes.





As a closing activity the different prototypes were presented to the remaining participants. It became evident that a benefit of having the participants apply Lego and Playdough when creating prototypes, was that the type of artefacts also motivates particular rich explanations. Mutual for all prototypes, was that only the designing group were able to identify the different elements. Hence, in all presentations, the designs and the reasoning behind the proposals were all vividly explained.

Appendix D.

Testing Attention at Almegaard

The persuasive learning design Attention was iteratively tested and evaluated on November 4.-6. 2013 at Almegaard Kaserne on Bornholm, Denmark. The test was scheduled to be the first out of a series of tests, aimed at establishing the potential of applying location and situation based games as a supplement or substitution of current learning designs.

For reference, this appendix summarises:

- Field notes
- Photo documentation
- Go-pro video documentation of test

62 conscripts participated in the tests of the learning design.

Attention is comprised by 2 independent elements:

- 15-minute introduction film, presenting the appropriate processes for waste management and disaster management.
- The Attention learning game, a learning design inspired by orienteering, where learners compete in teams to score points while all team members are individually tested on their knowledge about waste management

The introduction film includes exemplifying sequences from the military establishments as well as from civilian life. Thus the introduction film strives to motivate an awareness within the conscripts regarding the relation between appropriate behaviour both within and beyond the army context. This distinction corresponds to the understanding that part of the reason why Denmark continuously drafts military conscripts, is that those who leave the army continue on as valuable members of society.

Observations during the Attention game phase were conducted by myself in collaboration with two Master students from Aalborg University's education in experience design and information architecture respectively. In order to focus the collection of data through observation and photo documentation the following goals were outlined for the test:

Intended Learning Outcome:

- The conscripts must acquire knowledge about correct management of waste, fuel and water as well as knowledge about correct disaster management procedures.
- The conscripts must be able to recall this knowledge while under pressure.

Motivational goals:

- The learning design must influence the attitude of the conscripts and motivate them to recognise environmental education as fun, relevant and applicable in practice.

PHOTO OVERVIEW



Touch Screens were initially set up outdoors. However, after experiencing some technical difficulty, the screens were moved to an indoor location known as The Gas Chamber. The change in location also enabled us to video record the tests, as security would not be compromised.



The 15-minute introduction film was presented in the establishment auditorium. We had initially intended for Sergeant M to conduct the introduction, as this would increase credibility of the learning design. However, as Sergeant M preferred to just observe the test, the introduction was conducted by me. Sergeant M was present most for most of the test,

and I was moreover supplied with a corporal to function as a runner, and to assist me in giving the correct orders. As I am civilian, conscripts are not obliged to follow my orders, however they were kind to do so anyway.

During the introduction film it was observed that the conscripts remained attentive through most of the film, and that when the heat and the comfort of the seats made them lose concentration, they discretely went to stand up against the wall for a few minutes.



Having watched the introduction film, the conscripts were ordered to report to the location of the touch screens. The first group of conscripts conducted the test in full gear, however the following groups were instructed to change from boots to training shoes.

When arriving at the location of the touch screens, all conscripts were provided with individual chip bracelets divided into smaller groups and told to register by call name and employee number on the touch screens.



During test preparation, colour codes had been placed on relevant locations at Almegaard Kaserne. A map providing overview of the different locations was placed inside the Gas Chamber, thus enabling conscripts to

confirm their destination before running. It was subsequently brought to our attention that the map also gave the conscripts insight regarding facilities on the establishment where they did not usually spend time.



During the first iteration of testing, all groups had 6 members. This was observed to be too high a number, as too many conscripts were made to stand and wait for access to the touch screens. Consequently, in the following tests, the number of group members was lowered to 4-5.



We had brought cake along for the winning groups, but it was noted that the conscripts did not require further incitement to be active. The understanding that they were competing against the other segments was seen as highly motivating. The eagerness to compete was identified in quotes such as:

“Fuck yeah – I scored higher than Herstedvester. I gotta go rub his nose in it”

It was noted by one of the observers that the competitive aspect of the game could potentially outshine the learning potential of the design.

APPENDIX D.



With the smaller teams, it was noted that there was far less waiting around the touch screens, yet still enough for the conscripts to discuss the different scenarios and solutions. It was noted that on many occasions, conscripts did not only direct group members to the correct answer, they also articulated why the suggested solution was correct.

Examples of this was identified in quotes such as *"we can pour it down the normal drain. They said in the film that we only use eco-friendly soaps inside barrack buildings"* A statement which was made when one recruit was struggling to identify the correct way of disposing of soap water.



It was noted that there was a significant change in attitude as the conscripts moved from the auditorium and on to the Attention game. There was a friendly mocking going on between the conscripts as they commented on each other's results. E.g. the comment:

"For fuck sake Havnsø! How can you be that bad at waste management?! You confirm all allegations that women are better at multitasking than men"

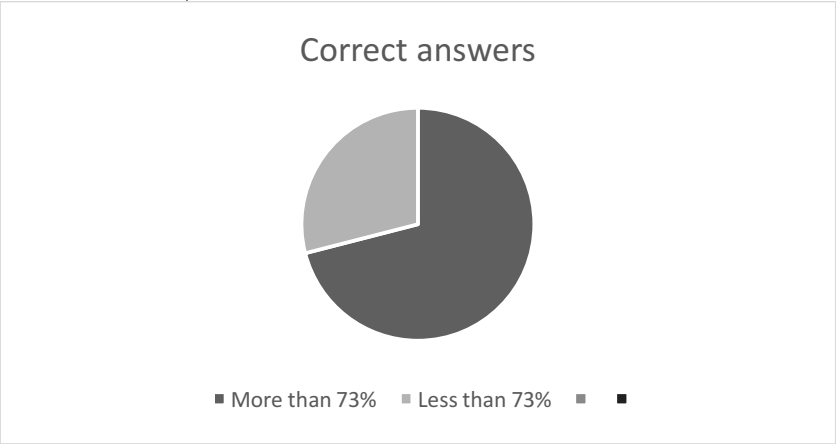


Conscripts were noticeably exhausted from the game activity, and several asked permissions to remove their coats. This was perceived as an indicator that the conscripts were physically active to an extent which qualified the learning design to be considered as part of their physical training.

Results and evaluation

Data extracted from the Attention touch screens provided the following overview of the conscripts results:

CORRECT ANSWERS	3/11	4/11	5/11	6/11	7/11	8/11	9/11	10/11	11/11
NUMBER OF CONSCRIPTS	1	2	2	4	9	14	15	11	4
RESULT IN PERCENTAGE	1,6	3,2	3,2	6,5	14,5	22,6	24,2	17,7	6,6



Immediately after completing the Attention game, all conscripts were asked to anonymously fill in a short survey, indicating their level of agreement with the following 3 statements:

4. It is important for me to know, how to manage waste correctly and how to respond in case of disaster situations
5. The Attention game made it fun to learn about how to look out for the environment
6. I will be able to use what I have learned to day, in the future

The surveys were filled out as the conscripts were catching their breaths after the game activity, spirits were high and the situation enabled the surveys to be supported by in-situ interviews with the conscripts. Survey results provided the following insights

	RATING:1	RATING: 2	RATING:3	RATING: 4	RATING: 5	AV
S: 1	3 (5,00%)	1(1,67%)	9 (15%)	22 (36,67%)	25 (41,67%)	4,08
S: 2	1 (1,67%)	5 (8,33%)	5 (8,33)	19 (31,67%)	30 (50%)	4,20
S: 3	1 (1,67%)	8 (13,33%)	12 (20%)	16 (26,67%)	23 (38,33)	3,87

From the survey, it was indicated that:

- 78,34 agree or strongly agree that knowledge about appropriate environmental behaviour is important to them
- 81,67% agree or strongly agree that the Attention game made learning about waste management fun
- 65% agree or strongly agree that the knowledge they have acquired through the learning design is applicable in the future.

